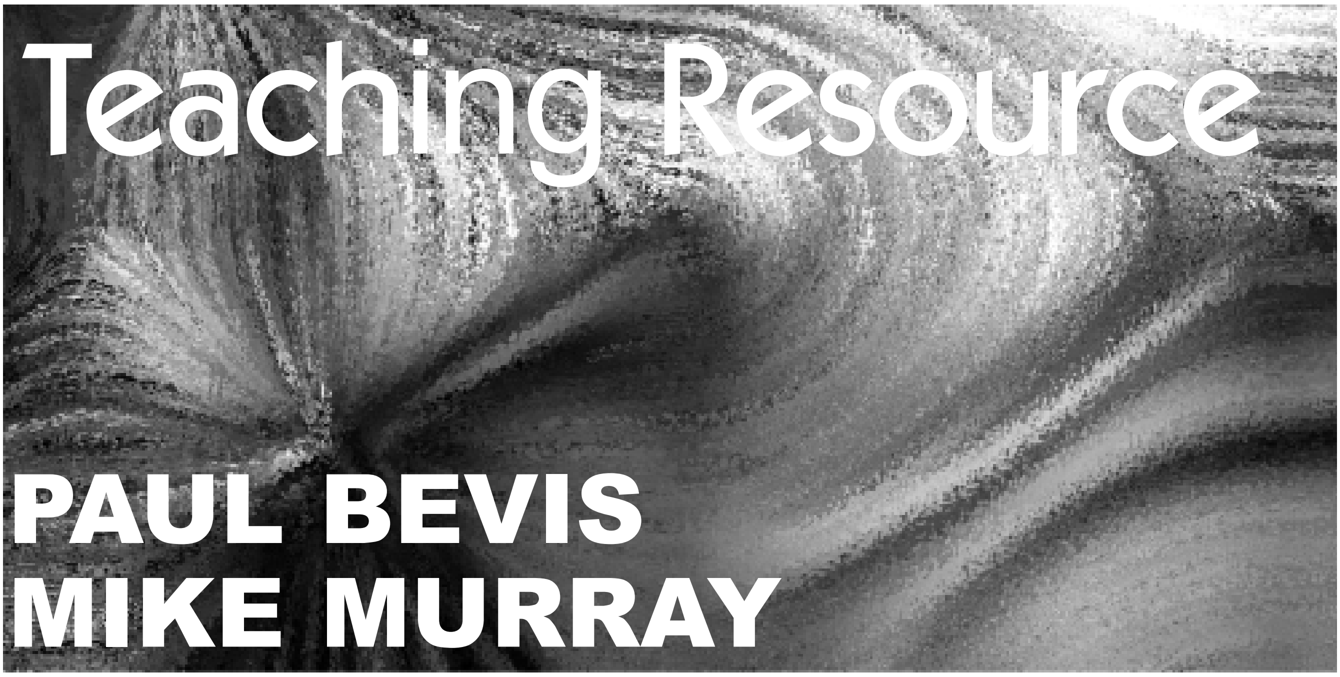
Sport & Physical Education



Teaching Resource

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General Considerations & Objectives

AS IT IS NOT ANTICPATED THAT THE WHOLE RESOURCE OF 366 PAGES WILL BE PRINTED OUT, PAGE NUMBERS ONLY APPEAR ON THE PDF AT THE TOP AND WITH THE THUMBNAILS WHICH SHOULD BE SELECTED FOR AT VIEW - SHOW/HIDE NAVIGATION PANES - PAGE THUMBNAILS.
CERTAIN GUIDANCE SHEETS ARE REPEATED
AT INTERVALS TO SAVE SCROLLING.

Area of content and knowledge covered by this study unit are as follows: -

- A general outline of the different kinds of fitness relevant to sport performance.
- How these fitness components may be tested.
- How to undertake tests so that they are accurate, valid and reliable
- An identification of which fitness components and tests may be relevant to the individual student as a performer
- Whether any of the fitness components show a statistical relationship.
- To begin to be able to make judgements about the relative fitness of themselves and others.
- To gather evidence to enable the planning for performance improvement.

Teaching Strategy

This learning unit allows for a great deal of independent group and individual work by the students. It is likely that they will need considerable support in organising themselves and others.

Students should be able to follow test directions from pre-prepared sheets. It is vital that safety is emphasised and the teacher should oversee certain tests.

The need for consistency of test protocol and accuracy of recording results must be constantly emphasised.

1. Introduce, through discussion the need for fitness testing.
2. Go over the student study pack with the students.
3. Identify tests to be undertaken from the specification
4. Give guidance notes on test protocol + results sheets
5. Determine test order and which ones the teacher will more directly control
6. Ascertain level of IT competency and agree how help is to be given to those that require it.
7. Introduce concepts of simple statistical analysis and how to undertake manually or by using a spreadsheet.

Fitness Testing

WHY?

- To determine individual strengths & weaknesses
- To establish a base from which to determine training loads
- To enable an evaluation of fitness improvement
- Measured improvement can be a great motivator

Fitness Testing

Validity & Reliability

- Fitness tests must be; **valid**

  They actually test what they set out to test

- Fitness tests must be; **reliable**

  If you repeat the test under the same conditions you will obtain a similar result

Achieving
Reliability & Validity

- Write/use a test procedure (protocol) and stick to it
- Take accurate measurements, measuring the same way for each subject
- Make the test specific as possible to the type of fitness you wish to test
- What other variables may be affecting your result?

Physical Measurements

Notes for Supervisors

Notes on the use of students in the measurement and testing of physical performance

These notes are an attempt to review the information currently available on the subject of what is considered to be good and safe professional practice in carrying out the tests outlined in this pack. They do not themselves constitute a definitive analysis or recommendation of safe practice.

It would appear that there is no clear policy relating specifically to such non-invasive, non-therapeutic physical tests as described here. However, tests involving human subjects must only be carried out under the supervision of a suitably qualified and responsible person. Supervisors of such tests do have a clear responsibility and legal obligation to take care of the health and safety of any person who may be affected by their acts or omissions. Codes of Safe Practice in educational establishments may vary from area to area, and from institution to institution, and the Supervisor has a duty to be aware of the relevant Health and Safety requirements.

COSHH Regulations/Guidelines must be followed in all respects.

All teachers are expected to exercise the same care for their students as would any reasonably careful parent when looking after her/his own children.

The exercise involved in the tests outlined here does not exceed that normally undertaken in supervised School/College physical education activities. The difference lies in the actual measuring techniques, which should only be undertaken by a suitably qualified member of staff, with a full understanding of the procedures involved.

Needless to say, the subject should be in good health. However, the subject may be reluctant to reveal the nature of a condition they might be suffering from, or even be unaware of its existence. Anybody who is medically excused normal physical education activities should not be the subject of any investigation into the effect of exercise on heart rate and/or respiration.

No pressure whatsoever must be exerted on the subject to take part in the test activity. It can be forgotten how difficult it may be for a young person to resist peer pressure, or even the gentlest persuasion when this comes from a member of staff.

One of the most difficult aspects of the testing procedure to control is that of interaction between participants. Certainly no element of competition should be allowed to enter the proceedings. Conversely, some subjects may deliberately 'under-achieve' as a result of such interaction. Therefore, although difficult to organise in the normal School/College situation, it is preferable that participants should not be exposed either to each other, or an audience, whilst under test.

It is generally thought advisable that prior informed consent be obtained for all investigations using students as the subjects. In the case of those under 18, such prior consent should be obtained from both the subject and the parent*(s)* or legally authorised representative. However, the DES *(1978)* comments that:

"as it is likely to be difficult to establish that a pupil undertook the experiment in full knowledge of the possible hazards, and with his/her full consent, teachers may consider it advisable to avoid all such experiments with pupils under 16."

Prior informed consent would be obtained by having the subject and the parent*(s)* or legally authorised representative read and sign an appropriate document, an outline example of which is provided.

In addition to all these precautions, standard professional insurance via the local education authority, school/college, and/or teachers' union should be available.

Sample
Prior Informed Consent Form

Title of Investigation/Experiment:...

Objectives:..

Description of Procedure:...

Questions All questions relating to the investigation or experiment will be answered in full.

Safety; All the procedures to be used in this investigation/experiment are widely and commonly used in Schools and Colleges, and although all activity involves some risk of an accident, the risk of harm in this investigation/experiment is no greater than in normal everyday life, or than in a supervised physical education lesson.

Right of Withdrawal: You are absolutely free to withdraw from the investigation/experiment at any time. If during the investigation/experiment you feel in any way uncomfortable and wish to stop, you should do so.

Reassurance of Confidentiality: All information obtained as a result of the investigation/experiment will be treated confidentially.

Availability of Results: The data may be recorded manually, and/or stored on a computer, but not in association with your name. You are entitled to a copy of your own results on request.

Use of Results: The data may be used in discussions and/or as part of assignments or projects, but not in association with your name. They will only be used to illustrate general physiological principles, and will not be used for diagnostic or any other purposes

Statement of Consent: I fully understand the nature of the tests, and agree to participate in this investigation/experiment. To the best of my knowledge I suffer from no illness or condition that will:

i prevent me from successfully completing the tests,

ii be made worse in anyway by my taking part in the tests.

Name of Subject:...

Signed:...

Date:..

Name of Parent or Legally Authorised Representative:

....

Signed:...**Date:**..
.

Health-Related Fitness Testing & Monitoring in Schools

A position statement on behalf of the Physical Education Association by its Fitness and Health Advisory Committee.

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Introduction

The current emphasis on health-related fitness education and the increased availability of cheaper equipment and relevant computer software seems to have regenerated interest in field or performance tests of physical fitness. Many physical education departments are administering their own fitness test batteries and developing norm tables or percentile charts against which to compare their students. Some departments are including scores in student profiles and others are using them as a means of evaluating the effectiveness of their teaching programmes. Yet, there has been very little informed discussions about whether the use of health-related fitness tests with children is a worthwhile education experience.

Limitations of Testing

The quantitative assessment of children's physical fitness is one of the most complex problems in exercise science, and health-related fitness tests suitable for use in the school environment which provide highly valid and objective measures of exercise-induced fitness are currently not available. All performance tests *(e.g. sit-ups, 12 minute run, flexed arm hang)* are primarily dependent upon the subject's motivation to do well, and several of the more popular field tests are not even based on sound physiological foundations. Many of the data generated by these tests are therefore problematic, not capable of rigorous interpretation and more likely to cause confusion than solve problems or clarify health-related concepts.

The sensitivity of the components of health-related fitness to training is largely dependent upon genetic endowment. Furthermore, as each child grows and develops at his/her own particular rate, it is extremely difficult to separate the contributions of growth, maturation and exercise to any observed changes in performance. In any third year class of boys, 20% of the group may be pre-pubertal, 20% at puberty stage 5, and the rest somewhere in between. The use of norm tables, therefore, confounds the issue of relative fitness, as tables constructed on the basis of chronological age cannot logically be used to classify individual children at different levels of skeletal and biological maturation. The constant comparison of children on the basis of test scores will affect those who score low in a negative manner. These children will tend to use negative attributions *(such as "I failed because I am no good")* rather more than a more positive appraisal *("I may never be an Olympic Champion, but I am improving").*

The advocates of fitness test batteries often assume that tests motivate individuals. There is no hard evidence to support this, and parallels in other areas of education would find supportive evidence only for those who do well. Often those who need to exercise the most find least encouragement from such situations. The use of external rewards *(e.g. badges)* can be a legitimate motivational tool when used properly, but educational psychology research has demonstrated that long-term intrinsic motivation can be undermined by the use of external rewards. Incentive schemes should be used sparingly and only to encourage initial participation or to reward personal competence. The use of external rewards to bribe children to participate is likely to be counter-productive in encouraging lifetime participation.

Educational Issues

The monitoring of health-related fitness is only likely to be worthwhile if it is considered within the wider objectives of education and not judged in isolation as a means of assessment. One of the objectives of health-related fitness education is to bring about lasting changes in children by enhancing the affective, cognitive, motor and social skills necessary for lifetime involvement in physical activity. The priority is to develop a positive attitude towards fitness rather than a transient change in physiological status. Consequently, pupils need the skills to be able to participate independently of teacher guidance. They will only be able to do this if they have the necessary knowledge base. Testing and monitoring techniques may be valuable teaching aids in stimulating interest, introducing new concepts in health-related fitness and in helping children to learn about and understand their bodies.

Health-related fitness monitoring can be designed to encourage positive attributions and feelings of personal control of future behaviour. Adult involvement in exercise is related to feelings of physical competence or physical self-esteem. Fitness activities seem to be superior to other physical education activities in self-esteem development. If health-related fitness testing and monitoring emphasises personal involvement and improvement rather than social comparison it can make a positive contribution to physical self-esteem and therefore subsequently to a lifetime commitment to exercise.

Conclusion It is therefore the view of the Physical Education Association that fitness testing and monitoring can be valuable components of a health-related fitness programmes if they are used:

i to encourage positive attitudes towards health-related fitness;

ii to increase understanding of the principles of health-related fitness;

iii to promote a lifetime commitment to health-related fitness.

However, teachers and students must be aware of the severe limitations of field tests in the complex analysis, assessment and classification of children's fitness.

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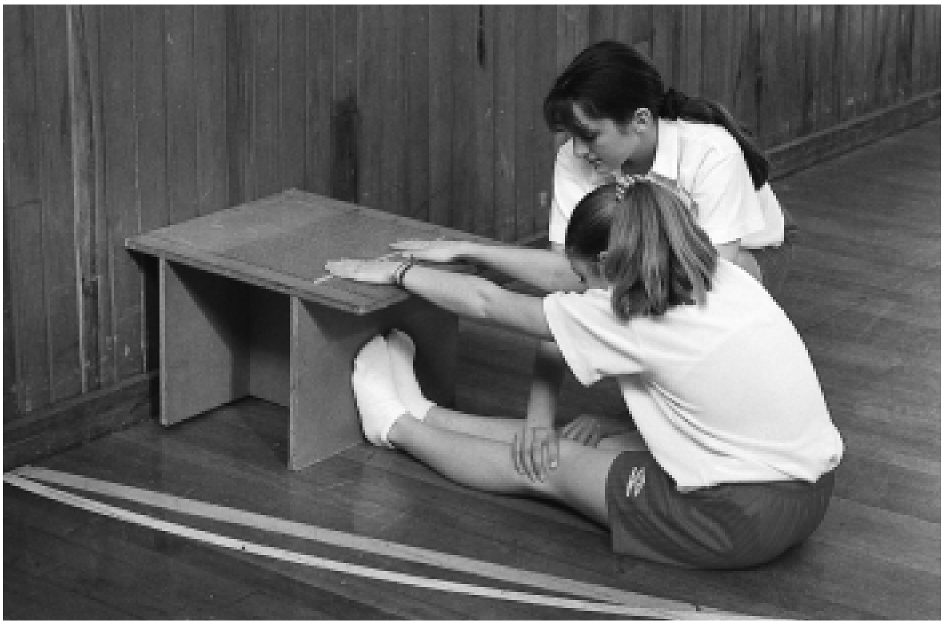
These following protocols are provided as a source of information, the responsibility of safe practice remains with the supervisor.

Flexibility

Flexibility is the capacity of a joint to move through its full range of motion. There is no single test that gives you a score for overall flexibility. Each test is specific to a particular movement or joints.

Sit & Reach Test

Procedure This test involves sitting on the floor with legs out straight ahead. Feet (shoes off) are placed flat against the box. Both knees are held flat by the tester (do not hyper-extend). The athlete leans forward slowly as far as possible and holds the greatest stretch for two seconds. Make sure there are no jerky movements, and that the fingertips remain level and the legs flat.



Score This recorded as the distance before (negative) or beyond (positive) the toes. Repeat twice and record the best score. The table below gives you a guide for expected scores (in cm) for adults.

Category	Men	Women
Super	> +27	>+30
Excellent	+17 to +27	+21 to + 30
Good	+6 to +16	+11 to + 20
Average	0 to +5	+1 to +10
Fair	-8 to –1	-7 to 0
Poor	-19 to -9	-14 to -8
Very Poor	< -20	< - 15

Validity This test only measures the flexibility of the lower back and hamstrings, and is a valid measure of this.

Reliability The reliability depends on the amount of warm-up allowed, and whether the same procedures are followed each time.

Advantages This is the most commonly used test of flexibility, so there is lots of data for comparison. Also, it is a cheap, easy and quick test to perform.

Disadvantages Variations in arm, leg and trunk length can make comparisons between individuals misleading.

Body Composition
Skinfold Measurement

Skinfold Callipers

Beneath the skin is a layer of subcutaneous fat, and the percentage of total body fat can be estimated by taking the 'skinfold' at selected points on the body. The only equipment needed is a pair of callipers

Procedure

Ensure that all of the skinfold measurements are located on the right side of the body and that the measurements are taken in millimetres.

Pick up the skinfold between the thumb and the index finger so as to include two thicknesses of skin and subcutaneous fat

Apply the callipers about one centimetre from the fingers and at a depth about equal to the thickness of the fold

Repeat the procedure three times as the measurement may vary and take an average

In order to standardise, measurements should be taken by the same person and at the same time of day, preferably in the morning.

Test sites

Triceps With the arm resting comfortably at the side, take a vertical fold parallel to the long axis of the arm midway between the shoulder and the tip of the elbow

Subscapula A diagonal fold across the back, just below the shoulder blade.

Biceps With the arm resting comfortably at the side, take a vertical fold halfway between the elbow and top of the shoulder on the front of the upper arm

Suprailiac Take a diagonal fold following the natural line of the iliac crest, just above the hip bone

Scoring Add the results of each measurement to get a total value in millimetres Using the table below determine the percentage body fat.

Skinfold	**Male (age in years)**				**Female (age in years)**			
(mm)	**17-29**	**30-39**	**40-49**	**50+**	**16-29**	**30-39**	**40-49**	**50+**
15	4.8	--	--	--	10.5	--	--	--
20	8.1	12.2	12.2	12.6	14.1	17.0	19.8	21.4
25	10.5	14.2	15.0	15.6	16.8	19.4	22.2	24.0
30	12.9	16.2	17.7	18.6	19.5	21.8	24.5	26.6
35	14.7	17.7	19.6	20.8	21.5	23.7	26.4	28.5
40	16.4	19.2	21.4	22.9	23.4	25.5	28.2	30.3
45	17.7	20.4	23.0	24.7	25.0	26.9	29.6	31.9
50	19.0	21.5	24.6	26.5	26.5	28.2	31.0	33.4
55	20.1	22.5	25.9	27.9	27.8	29.4	32.1	34.6
60	21.2	23.5	27.1	29.2	29.1	30.6	33.2	35.7
65	22.2	24.3	28.2	30.4	30.2	31.6	34.1	36.7
70	23.1	25.1	29.3	31.6	31.2	32.5	35.0	37.7
75	24.0	25.9	30.3	32.7	32.2	33.4	35.9	38.7
80	24.8	26.6	31.2	33.8	33.1	34.3	36.7	39.6
85	25.5	27.2	32.1	34.8	34.0	35.1	37.5	40.4
90	26.2	27.8	33.0	35.8	34.8	35.8	38.3	41.2
95	26.9	28.4	33.7	36.6	35.6	36.5	39.0	41.9
100	27.6	29.0	34.4	37.4	36.4	37.2	39.7	42.6

Typical Scores The average man has 15 to 17% body fat, while the average woman is between 18 and 22%. Typical scores for elite athletes are 6 to 12% for men and 12 to 20% for women

Validity Not a good predictor of percent body fat, however can be used to indicate changes in body composition over time.

Reliability Can vary from tester to tester depending on the skill and experience of the tester.

Advantages Skinfold measurements are widely utilised to assess body composition. It is a lot simpler than hydrostatic weighing. After the outlay for callipers, the tests costs are minimal.

Body Mass Index (BMI)

Procedure Calculation from body mass and height.

BMI = M / (H x H),

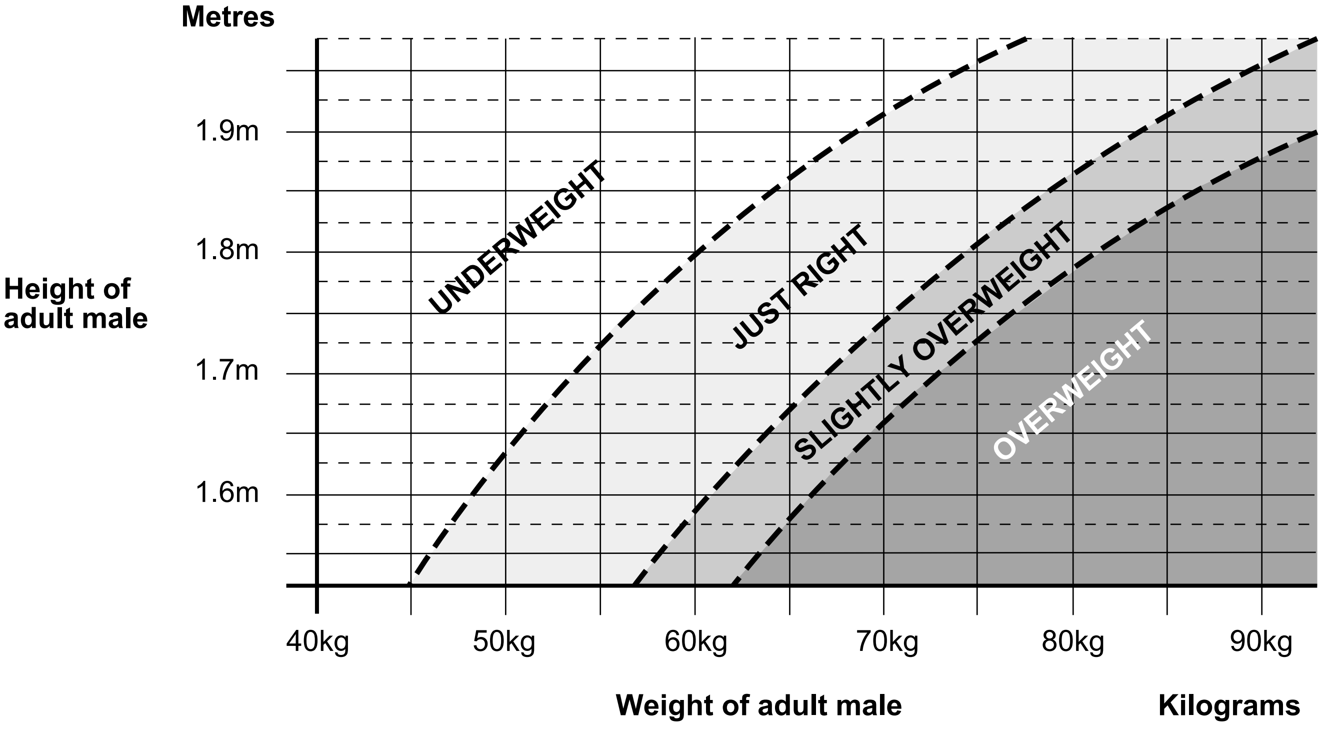
M = body mass in kilograms and H = height in metres.

Scoring The higher the score normally indicating higher levels of body fat.

Healthy	20 - 25
Over weight	25 - 30
Obese	> 30

Advantages Simple calculation from standard measurements

Disadvantages BMI can be inaccurate, for example with large and muscular though lean athletes scoring high BMI levels which incorrectly rates them as obese.



Harvard Step Test

The Harvard step test gives an indication of how fit your cardiovascular system is.

The test is simple. Step up on to a standard gym bench one once every two seconds for five minutes (150 step ups). Use a metronome or a friend to help you keep pace.

Measure your pulse for 30 seconds; one minute, two minutes and three minutes after stopping the step ups.

Some questions to reflect upon

- Does the height of the bench or the step affect the pulse?
- Does the pace of the steps affect the pulse and recovery?
- How would you go about investigating this?
- What happens if the pulse is measured for fifteen seconds at 1, 2, and 3 minutes?

Queens College Step Test

Procedure The athlete steps up and down on the platform at a rate of 22 steps per minute for females and at 24 steps per minute for males, for a total of 3 minutes. The athlete immediately stops on completion of the test, and the heart beats are counted for 15 seconds from 5-20 seconds of recovery.

Equipment required 16.25 inches or 41.3 cm step, stopwatch, metronome or cadence tape, heart rate monitor (optional).

Reliability Test re-test reliability for recovery heart rate was r = 0.92

Validity Correlation between recovery heart rate and V_{O_2}max was r = -0.75.

Advantages Minimal equipment and costs involved, little time required, and can be self-administered.

Disadvantages Is influenced by variations in maximum heart rate.

Vertical Jump Test

Procedure The athlete stands side on to a wall and reaches up with the hand closest to the wall. Keeping the feet flat on the ground, the point of the fingertips is marked or recorded. The athlete then stands away from the wall, and jumps vertically as high as possible using both arms and legs to assist in projecting the body upwards. Attempt to touch the wall at the highest point of the jump. The difference in distance between the reach height and the jump height is the score. The best of three attempts is recorded.

Scoring

% Rank	Females	Males
91-100	76.20 - 81.30 cm	86.35 - 91.45 cm
81 - 90	71.11 - 76.19 cm	81.30 - 86.34 cm
71 - 80	66.05 - 71.10 cm	76.20 - 81.29 cm
61 - 70	60.95 - 66.04 cm	71.10 - 76.19 cm
51 - 60	55.90 - 60.94 cm	66.05 - 71.09 cm
41 - 50	50.80 - 55.89 cm	60.95 - 66.04 cm
31 - 40	45.71 - 50.79 cm	55.90 - 60.94 cm
21 - 30	40.65 - 45.70 cm	50.80 - 55.89 cm
11 - 20	35.55 - 40.64 cm	45.70 - 50.79 cm
1 - 10	30.50 - 35.54 cm	40.65 - 45.69 cm

The following table is for 15 to 16 year old athletes:

Gender	Excellent	Above average	Average	Below average	Poor
Male	>65cm	56-65cm	50-55cm	40-49cm	<40cm
Female	>60cm	51-60cm	41-50cm	35-40cm	<35cm

Jump height can be converted into a power score

$P = W \times (4.9 \times D)^2$

P = power in kg.m/sec

W = body mass in kg

D = height jumped in m

Equipment required Measuring tape or marked wall (or timing mat).

Advantages Simple and quick to perform

Standing Long (Broad) Jump Test

Test procedure Stand at a mark with feet slightly apart. Using a two foot take-off and landing, swing the arms and bend the knees to provide forward drive. Measure the longest distance jumped. The jump must be repeated if the athlete falls back or uses a step at take-off.

Equipment required Measuring tape and non-slip floor. A long jump landing pit may be used.

Scoring The following data has been obtained from the results of tests conducted with world class athletes.

% Rank	Females	Males
91-100	2.94 - 3.15 m	3.40 - 3.75 m
81 - 90	2.80 - 2.93 m	3.10 - 3.39 m
71 - 80	2.65 - 2.79 m	2.95 - 3.09 m
61 - 70	2.50 - 2.64 m	2.80 - 2.94 m
51 - 60	2.35 - 2.49 m	2.65 - 2.79 m
41 - 50	2.20 - 2.34 m	2.50 - 2.64 m
31 - 40	2.05 - 2.19 m	2.35 - 2.49 m
21 - 30	1.90 - 2.04 m	2.20 - 2.34 m
11 - 20	1.75 - 1.89m	2.05 - 2.19 m
1 - 10	1.60 - 1.74 m	1.90 - 2.04 m

The following table is for 15 to 16 year old athletes:

Gender	Excellent	Above average	Average	Below average	Poor
Male	> 2.01m	2.00 - 1.86m	1.85 - 1.76m	1.75 - 1.65m	<1.65m
Female	>1.66m	1.65 - 1.56m	1.55 - 1.46m	1.45 - 1.35m	<1.35cm

Cooper Test

Equipment required

To undertake this test you will require:

A track, pitch, circuit marked every 100m

Stop Watch

Test procedure

The test comprises of seeing how far an athlete can run/walk in twelve minutes. The coach should record the total distance covered to the nearest 100 metres.

Analysis

Analysis of the results, distance covered, is by comparing it with the results of previous tests. It is expected that, with appropriate training between each test, the analysis will indicate an improvement in the athlete's general endurance. The following table rates performance for young athletes.

Gender & Age	Excellent	Above average	Average	Below average	Poor
Male 13-14	>2700m	2400-2700m	2200-2399m	2100-2199m	<2100m
Females 13-14	>2000m	1900-2000m	1600-1899m	1500-1599m	<1500m
Males 15-16	>2800m	2500-2800m	2300-2499m	2200-2299m	<2200m
Females 15-16	>2100m	1900-2100m	1700-1899m	1500-1699m	<1500m
Males 17-20	>3000m	2700-3000m	2500-2699m	2300-2499m	<2300m
Females 17-20	>2300m	2100-2300m	1800-2099m	1500-1799m	<1500m

Multistage Fitness Test

Introduction

The Multistage Fitness Test provides a sufficiently accurate estimate of an athlete's V_{O_2} Max. This test is very good for games players as it is specific to the nature of the sport but, due to the short turns, is perhaps not suitable for rowers, runners or cyclists.

Required Resources

A flat, non slippery surface at least 20 metres in length

30 metre tape measure

Marking cones

Pre-recorded audio tape (from Coachwise)

Tape recorder

Recording sheets

Test Procedure

The test is made up of 23 levels where each level lasts approx 1 minute. Each level comprises of a series of 20m shuttles where the starting speed is 8.5km/hr and increases by 0.5km/hr at each level. On the tape a single beep indicates the end of a shuttle and 3 beeps indicates the start of the next level.

The test is conducted as follows:

- Measure out a 20 metres section and mark each end with a marker cone
- Carry out a warm up programme of jogging and stretching exercises
- You must place one foot on or beyond the 20m marker at the end of each shuttle
- If you arrive at the end of a shuttle before the beep, wait for the bleep and then resume running
- You keep running for as long as possible until you can no

Level	Shuttle	V0$_2$ max
4	2	26.8
4	4	27.6
4	6	28.3
4	9	29.5

Level	Shuttle	V0$_2$ max
5	2	30.2
5	4	31.0
5	6	31.8
5	9	32.9

Level	Shuttle	V0$_2$ max
6	2	33.6
6	4	34.3
6	6	35.0
6	8	35.7
6	10	36.4

Level	Shuttle	V0$_2$ max
7	2	37.1
7	4	37.8
7	6	38.5
7	8	39.2
7	10	39.9

Level	Shuttle	V0$_2$ max
8	2	40.5
8	4	41.1
8	6	41.8
8	8	42.4
8	11	43.3

Level	Shuttle	V0$_2$ max
9	2	43.9
9	4	44.5
9	6	45.2
9	8	45.8
9	11	46.8

Level	Shuttle	V0$_2$ max
10	2	47.4
10	4	48.0
10	6	48.7
10	8	49.3
10	11	50.2

Level	Shuttle	V0$_2$ max
11	2	50.8
11	4	51.4
11	6	51.9
11	8	52.5
11	10	53.1
11	12	53.7

Level	Shuttle	V0$_2$ max
12	2	54.3
12	4	54.8
12	6	55.4
12	8	56.0
12	10	56.5
12	12	57.1

Level	Shuttle	V0$_2$ max
13	2	57.6
13	4	58.2
13	6	58.7
13	8	59.3
13	10	59.8
13	13	60.6

Level	Shuttle	V0$_2$ max
14	2	61.1
14	4	61.7
14	6	62.2
14	8	62.7
14	10	63.2
14	13	64.0

Level	Shuttle	V0$_2$ max
15	2	64.6
15	4	65.1
15	6	65.6
15	8	66.2
15	10	66.7
15	13	67.5

Level	Shuttle	V0$_2$ max
16	2	68.0
16	4	68.5
16	6	69.0
16	8	69.5
16	10	69.9
16	12	70.5
16	14	70.9

Level	Shuttle	V0$_2$ max
17	2	71.4
17	4	71.9
17	6	72.4
17	8	72.9
17	10	73.4
17	12	73.9
17	14	74.4

Level	Shuttle	V0$_2$ max
18	2	74.8
18	4	75.3
18	6	75.8
18	8	76.2
18	10	76.7
18	12	77.2
18	15	77.9

Level	Shuttle	V0$_2$ max
19	2	78.3
19	4	78.8
19	6	79.2
19	8	79.7
19	10	80.2
19	12	80.6
19	15	81.3

Level	Shuttle	V0$_2$ max
20	2	81.8
20	4	82.2
20	6	82.6
20	8	83.0
20	10	83.5
20	12	83.9
20	14	84.3
20	16	84.8

Level	Shuttle	V0$_2$ max
21	2	85.2
21	4	85.6
21	6	86.1
21	8	86.5
21	10	86.9
21	12	87.4
21	14	87.8
21	16	88.2

(Department of Physical Education and Sports Science Loughborough University)

Fitness Test Results Sheet

Subject	Sit & Reach	Standing Long Jump	Vertical Jump	12 Min Run	Skinfold	NCF Shuttle Run	Queens College Step	1 Rep Max	Vital Capacity	Harvard Step Test	Press Up Test	Bent Arm Hang

Part 2 Teaching Resource

‘How do I Improve my Performance through Fitness Development?’

Teaching Strategy and Resources

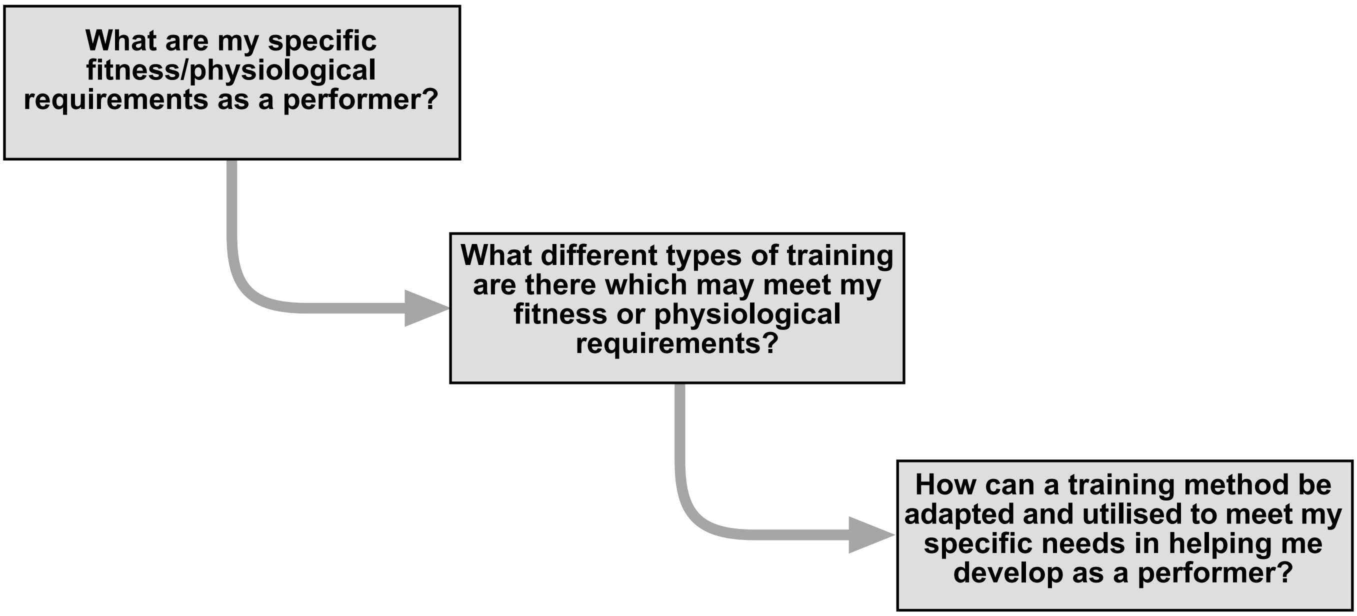
Teaching Strategy

It is important to bear in mind the learning objectives that have been set for the student: -

- To understand the principles of training and how to apply them to an individual performer
- To understand and experience the different methods by which fitness may be improved
- To be able to relate methods of fitness training and the principles of training to the specific needs of a performer.

In addition the work must be based upon extending the student's experience, drawing upon their knowledge and meeting their specific needs. The work done in this part and in part 1 is setting the scene and providing the underpinning knowledge for devising the Personal Exercise Plan.

Teaching route



What are my specific fitness/physiological requirements as a performer?

What different types of training are there which may meet my fitness or physiological requirements?

How can a training method be adapted and utilised to meet my specific needs in helping me develop as a performer?

Supporting the Student

Students will require direct teaching or support in a number of areas.

a Identifying the fitness requirements of their performance activity, partcularly in relation to intensity of work.

b Students normally find constructing a circuit training programme relatively straight forward. Check they have given a sensible order of activities, allowing major muscle groups to recover.

c Devising an interval training programme specific to their needs. Get your students to attempt to do this using the interval training guidance sheet supplied. It is often useful to get them to work in pairs for this activity. When they have completed a draft training schedule, review the programme with them. Students frequently over estimate the amount of work with which they will be able to cope.

d For task 4 and 5 it is best to go over the principles of training first. Then ask the students to adapt the two minute run accordingly.

e Finally students will probably need a great deal of help in adapting either their circuit or interval training programmes to their identified performance needs. The essential fact for the students to grasp is that as an individual improves they must maintain the level of overload.

f This unit of work can be linked with the mini project and should require them to research their fitness needs, plan their fitness programme and evaluate their progress after a period of weeks.

g As an extension task for more advanced students they can be asked to read up on energy systems and then to link work intensity and recovery period length and activity to the use of the relevant energy system.

Identifying Fitness Requirements

Movement/action within the performance activity	Fitness requirement

Interval Training Planning Sheet

Training Distance (metres) (seconds)	Intensity (as % max)	Recovery Period

Guide to Interval Training

1 Interval training is a combination of periods of work and periods of recovery.

2 Interval training is a much used training system because it may be adapted to the needs of a wide range of fitness requirements for sport performers.

3 The variables which may be changed to make the training specific to the needs of an individual perfomer are:-

- ▼ Distance covered
- ▼ Intensity of the work
- ▼ Number of times the work period is repeated (a set)
- ▼ Number of sets within a session
- ▼ The length of the recovery period
- ▼ The type of activity undertaken during the recovery period.

4 From your sport performance fitness analysis identify the typical distances undertaken during competitive activity and the intensity of the activity.

5 To determine intensity find your best time over each of the identified distances. Intensity should be then calculated as a percentage of the best time.

6 The number of repetitions and sets should reflect the intensity and duration of the work period and the level of fitness of the participant.

7 The length of the recovery period may be determined in two ways.

a Wait until the heart rate has returned to 140-150bpm.

b Use a ratio of work time to recovery time. For aerobic work use a work:recovery ratio of 1:10. For moderately intense activity a work:recovery ratio of 1:2 may be used. For high intesnity work a ratio of 1:3 is suitable.

8 The type of recovery activity is determined by the intensity of the work period. Very short, high intensity work may require no more than stretching during the recovery period, medium to high intensity work periods require a more active recovery, jogging or walking.

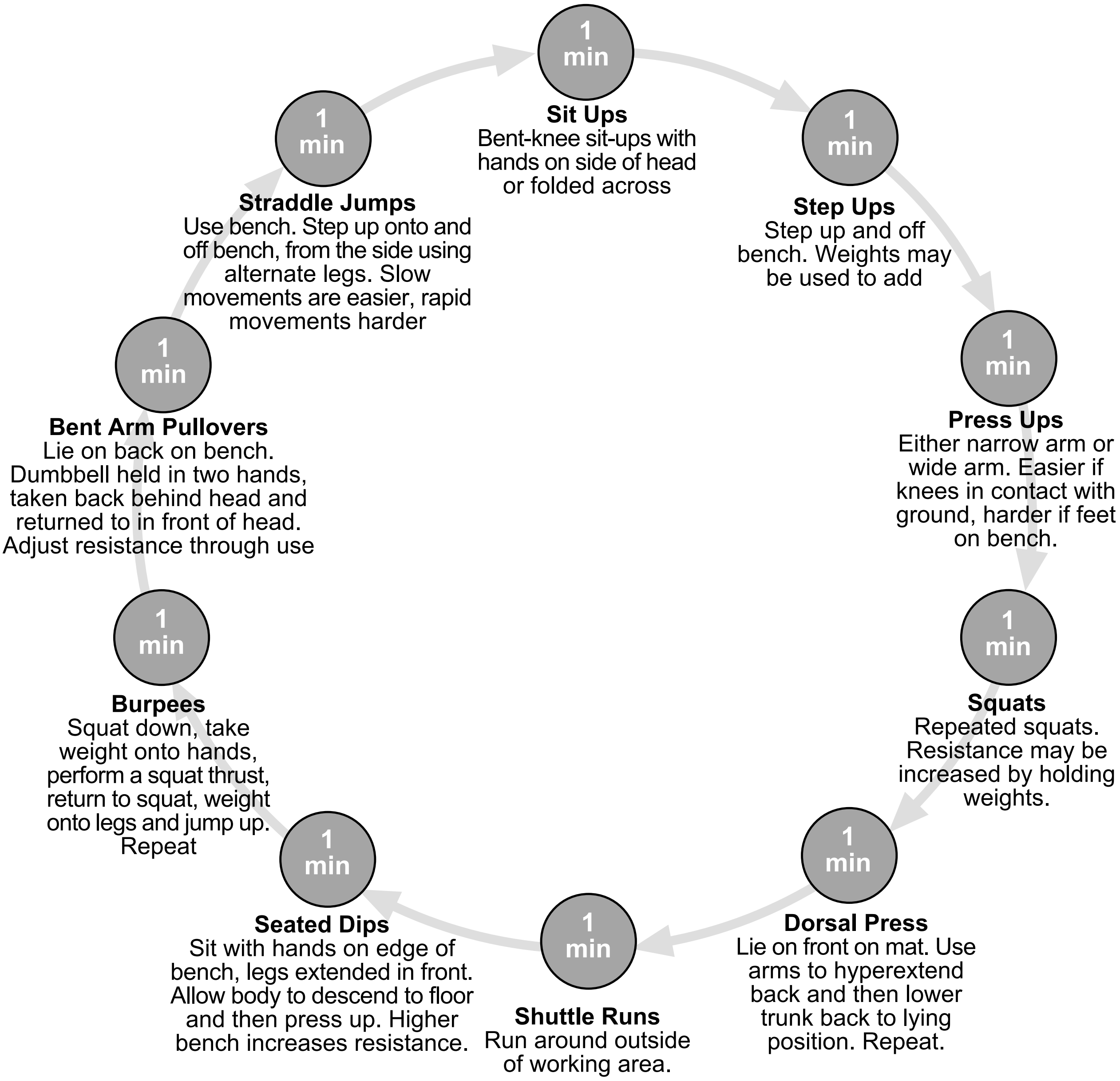
You may wish to read up on the energy systems and link work intensity and recovery period length and activity to the use of the relevant energy system.

10-station Circuit Training Programme

A 10-station circuit training programme to introduce movement analysis

Each exercise is performed for 1 minute (30 seconds might be sufficient for very limited performers!) before moving onto the next station.

Each circuit is completed three times. Total time 30 (15) minutes.



Sit Ups
Bent-knee sit-ups with hands on side of head or folded across

Step Ups
Step up and off bench. Weights may be used to add

Press Ups
Either narrow arm or wide arm. Easier if knees in contact with ground, harder if feet on bench.

Squats
Repeated squats. Resistance may be increased by holding weights.

Dorsal Press
Lie on front on mat. Use arms to hyperextend back and then lower trunk back to lying position. Repeat.

Shuttle Runs
Run around outside of working area.

Seated Dips
Sit with hands on edge of bench, legs extended in front. Allow body to descend to floor and then press up. Higher bench increases resistance.

Burpees
Squat down, take weight onto hands, perform a squat thrust, return to squat, weight onto legs and jump up. Repeat

Bent Arm Pullovers
Lie on back on bench. Dumbbell held in two hands, taken back behind head and returned to in front of head. Adjust resistance through use

Straddle Jumps
Use bench. Step up onto and off bench, from the side using alternate legs. Slow movements are easier, rapid movements harder

Circuit Training Guide
50 Exercises

Equipment required Aerobic mats, Rebok steps or benches (or equivalent), set of dumb-bells of various weights.

Exercise name	Description
Abdominal crunchies	Lie on back, arms folded or hands behind head. Knees bent. Sit up to lift back off floor; lower back to floor. Repeat for duration of set. Works abdominal muscles
Abdominal press	Lie on front. Support body weight on elbows and toes only. Hold position for duration of set. Principally works abdominal postural muscles.
Alternate dumb-bell punching	Stand. Dumb-bell in each hand with arms bent and dumb-bells held near chin. Punch out one hand at a time and return to starting position. Repeat for duration of set. Mainly works deltoid muscles
Alternate leg v-sits	Lie on back. Legs straight. Lift legs alternately, whilst at the same time raising trunk off ground. Arms free, or across chest, or behind head. Repeat for duration of set. Works abdominal and quadriceps muscles.
Astride jumps	Stand with legs astride a bench. Jump up onto bench and immediately jump back to astride position. Repeat rapidly for duration of set. Aerobic exercise.
Back hyperextensions	Lie on front. Raise trunk off ground; hold position; allow to return to beginning. Repeat for duration of set. Hands may be placed behind head or back. Works erector muscles in back, and hamstrings.
Bench press	Lie on bench. Dumb-bell in each hand held on chest. Press each dumb-bell upwards and return to chest. Repeat for duration of set. Works pectoral muscles and triceps.
Bent over rowing	Stand with legs apart and slightly flexed, body bent at waist. Dumb-bell in each hand hanging down towards ground. Lift dumb-bell up towards shoulder and allow to return to arms extended. Repeat for duration of set. Works latissimus dorsi muscles.
Bicep curls	Use dumb-bells. From arms extended, palms uppermost, curl dumb-bell to arms flexed, under chin. May be repeated with arms together or arms alternately for duration of set. Works biceps brachii.

Continued.....

Bum jumps	Same as astride jumps, but when feet are astride bench, a squat is performed until backside touches bench, and the jump up onto the bench is made from this squat position. Repeated for whole of set. Aerobic, but works quadriceps quite hard.
Burpees	Squat down, take weight onto hands, perform a squat thrust, return to squat, weight onto legs and jump up. Repeat rapidly for duration of set. General aerobic exercise.
Calf raises	Stand upright. Raise body up by moving onto toes and then lowering. Repeat for whole of set. Works gastrocnemius muscle.
Cossacks	Support body weight on hands and feet with back towards ground. Kick out using alternate legs. Repeat for duration of set. Speed of movement dictates difficulty. General aerobic exercise.
Crossovers	From standing, lift one leg and bring down opposite elbow to touch knee. Return and repeat using other leg. Repeat for duration of set with rate of movement dictating effort. General aerobic exercise.
Doggy kicks	Start on hands and knees on a mat. Abduct and return alternate legs, keeping knee bent. Continue for all of set. Works leg abductors.
Dorsal press	Lie on front on mat. Use arms to hyperextend back and then lower trunk back to lying position. Repeat for duration of set. Works on back flexibility.
Dumb-bell bent arm pullovers	Lie on back on bench. Dumb-bell held in two hands; taken back behind head and returned to in front of head. Adjust resistance through use of different weights. Can be done in seated or standing position. Mainly works triceps.
Dumb-bell lateral raise	Stand or sit with dumb-bell in each hand hanging at side of body. Lift arms out to side until hands are at shoulder height. Lower arms back to side. Repeat for duration of set. Works deltoid muscles.
Dumb-bell tricep press	Stand or sit with dumb-bell in one hand and held above shoulder with arm flexed. Slowly straighten arm to vertical (use other arm to stop lateral movements). Return to starting position and repeat for duration of set. Tricep exercise
Fly's	Lie on bench, dumb-bell in each hand, arms extended vertically. Gently lower arms to outstretched (crucifix) position and return to start. Repeat slowly for duration of set. Mainly works pectorals.
High knee sprints	Running on spot with high knee lift. Speed of movements and/or height of knees dictates degree of effort used. Mainly aerobic exercise.
Jumping jacks	Stand upright, arms at side. Spring to legs astride position whilst at same time flinging arms out to abducted position. Jump back to starting position. Repeat rapidly for duration of set. Aerobic exercise.

Continued.....

Jump over	Use several benches locked into position to provide some height. Stand to one side of benches with hands on bench. Use a two-footed jump to clear benches and land on other side. Repeat for whole of set. Aerobic exercise.
Kick backs	Rest on hands and knees. Lift one leg off ground and extend then hyperextend, and return to start. Repeat without rest for half of set then change working leg. Works hamstrings and gluteals.
Leg lift	Use alternate legs in a high forward kicking action. Try to keep leg straight when kicking. Repeat for duration of set. Aerobic exercise
Lizards	Lie on front on floor, with arms extended above head. Raise one leg and opposite arm off floor and return. Repeat using alternative legs and arms for duration of set. Works deltoids and hamstrings.
Lunges	From standing take a long pace forward and allow trunk to descend by bending both knees. Return to starting position and repeat with other leg leading. Alternate lead leg for duration of exercise. Works quadriceps and is also aerobic.
Lying abductors	Lie on side on floor. Keep lower leg bent at knee. Alternatively raise and lower top leg for half the duration of the set, then change sides. Works leg abductors
Lying adductors	Lie on side on floor. Keep upper leg bent at knee and place the foot of this leg on the floor in front of lower leg. Alternatively raise and lower bottom leg for half the duration of the set, then change sides. Works leg adductors.
Obliques	Lie on back, knees slightly bent, arms folded or hands behind head. Sit up and twist trunk so that elbow touches opposite knee. Return to start and repeat using alternate elbows for duration of set. Specifically works oblique muscles.
Press ups	From front support position, using either a narrow arm or wide arm starting position. Lower body to the floor and then straighten arms. Easier if knees in contact with ground, harder if feet on bench. Repeat slowly for duration of set. Wide arm concentrates on pectoral muscles, narrow arm on triceps.
Reverse abdominal curl	Lie on back with legs held up and pointing to ceiling. Lift legs higher and then lower. Easier with knees bent. Harder if sit up employed as well. Repeat for whole set. Works lower abdominal muscles.
Seated dips	Sit with hands on edge of bench, legs extended in front. Allow body to descent to floor and then press up. Higher bench increases resistance. Works triceps.

Continued.....

Shoulder press	Stand or sit with dumb-bell in each hand at shoulder height. Press dumb-bell up vertically to full extension and then lower to starting position. Repeat slowly until end of set. Deltoids and triceps are worked.
Shuttles	Run around outside of working area, or as alternate run to line and back. Pace dictates difficulty. Aerobic activity. Sprinting also works hamstrings.
Single leg squat thrusts	Front support position with one leg forward and one back. Perform rapid exchange of leg positions for duration of set. Speed and range of movement dictate effort. Aerobic exercise
Single leg squats	Stand on one leg. May need support. Hold other leg out In front of body and gently lower body down as standing leg flexes. Extend working leg. Change working leg. Quadriceps exercise.
Sit-ups	Lie on floor with knees bent. Perform sit-ups with hands on the sides of the head or folded across chest for duration of set. Works abdominal muscles.
Spotty dog	Stand with one leg forward and other back. Hold opposite arms forwards and back. Jump to change positions. Repeat quickly for duration of set. Aerobic exercise.
Squat jumps	From standing, rapidly flex knees to approx right angles and then suddenly jump into the air. Land and immediately repeat for duration of set. Aerobic exercise but heavy demand on quadriceps and gastrocnemius.
Squat thrusts	From front support position, thrust legs forwards to under chest, and then quickly return to front support. Repeat. Rapid movements. General aerobic exercise and leg conditioning
Squats	From standing, perform repeated squats by bending knees and then straightening legs for duration of set. Resistance may be increased by holding weights. Mainly quadriceps worked
Star jumps	From standing, jump into air and abduct and adduct both legs and arms before landing back in a standing position. Repeat quickly throughout set. Mainly aerobic, but heavy on quadriceps as well.
Static squats	Hold a semi-squat position for duration of set. Made more difficult by introducing slight bouncing through range of movements. Quadriceps exercise.
Step up with leg raise	Alternate leg step up onto and off bench, but with the addition of a full flexion of the knee of the trailing leg following the step up. Repeat for full set. Aerobic exercise
Step ups	Step up and off bench. Weights may be used to add resistance; speed of movement also important for resistance. Keep going for all of set. Aerobic exercise, but can work quadriceps.

Continued.....

Straddle jumps	Use step. Step up onto and off bench, from the side using alternative legs. Slow movements are easier; rapid movements harder. Aerobic exercise.
Straight arm pullovers	Lie on bench. Dumb-bells on hands, with arms fully extended behind head. Slowly bring arms to vertical and then lower onto abdomen. Keep arms locked straight throughout movement. Repeat for all of set. Deltoid and pectoral exercise.
Toe taps	Stand with one leg on floor and other on edge of bench. Jump and exchange leg positions. Repeat rapidly for whole of set. Aerobic exercise.
Upright rowing	Stand with dumb-bells in hands, arms extended in front of body. Slowly raise dumb-bells to chin, keeping elbows high. Lower and repeat slowly for duration of set. Deltoid muscles worked
v-sits	Lie on floor. Arms extended above head. Lift trunk and legs simultaneously to form v-shape of body. Return to lying and repeat throughout duration of set. Works abdominal muscles.

Part 3 Teaching Resource Pack

‘My Fitness Plan’

General Considerations & Objectives

This Part is designed to enable the student to plan and begin using their personal exercise programme.

Candidates will find it sensible to stick to either using a circuit or interval training programme. Weight training requires more supervision and equipment and can be more difficult to monitor. Having said that however the personal exercise programme must reflect the students needs as a performer or partcipant.

Above all teachers must ensure that students have been correctly instructed in the techniques of the exercises involved in any training programme, are medically fit to undertake the designed programme and supervised at an appropriate level.

Developing a Weight Training Programme

Weight training is the most widely used and popular method of increasing strength. For young and/or novice performers the development of all round strength is best achieved via circuit training and then progressing this through to strength training.

A muscle will only strengthen when forced to operate beyond its normal loading. Overload can be progressed or achieved by increasing the resistance (weight), by increasing the number of repetitions with a particular weight or by increasing the intensity by reducing the recovery periods.

The following steps will hep in the development of your own weight training programme.

1 Make it specific

The exercise must be specific to the type of strength required, and is therefore related to the particular demands of the event (specificity). You and your coach/teacher should have knowledge of the types of muscular activity associated with the particular event, the movement pattern involved and the type of strength required.

2 Which exercises?

Identify exercises that will produce the desired development. Although specificity is important the following exercises are likely to be included.

Bench Press, Sit Ups, Chest Press Arm Curls, Lat Pull downs, Tricep Press, Calf Raise, Bicep Curls, Leg Curls Leg Extension.

These general exercises give a balanced development, and provide a strong base upon which highly specific exercise can be built.

It is vital that you get an experienced coach or teacher to demonstrate the correct technique before you begin using weights.

3 What order?

Having determined which exercises you are going to use you must then place them in an exercise order. In general rotate through the major areas of the body – arms, legs, trunk then back to the arms

4 Determining the weight

The amount of weight to be used should be based on a percentage of the maximum amount of weight that can be lifted one time, generally referred to as one repetition maximum (1RM). It is better to start with low weights and work up.

4 Determining the number of repetitions

One set of 8-12RM performed 3 days a week is a typical strength-training programme. The greatest strength gains appear to result from working with 4-6RM. Increasing this to 12-20RM favours the increase in muscle endurance and mass.

5 How frequently should I train?

This is really linked with recovery since the body must be allowed to recover from the strenuous demands of strength training. As a 'rule of thumb' 48 hours should elapse between sessions.

6 What sort of weight lifting equipment?

There are variable resistance machines and free weights. Variable resistance machines are effective tools for building strength and muscle tone and are designed to work the target muscle in isolation. Free weights allow you not only to target a particular muscle group but also to engage other muscles that assist in the work. Using free weights is a skilled activity and should only be undertaken after expert instruction and with supervision. Variable resistance machines are generally simpler and safer to use.

7 I am a beginner, how should I start?

Use a simple set e.g. 3 x 8 with 70% - meaning three sets of eight repetitions with a weight of 70% of maximum for one repetition. This is the system that all novice lifters should work on, because the high number of repetitions enables the lifter to learn correct technique, and thereby reduce the risk of injury.

8 How can I be safe in the Weight Room?

Strength training is safe when properly supervised and controlled and some basic rules are observed.

Train only with permission and work in pairs - one lifting the other spotting (supporting)

Follow your training schedule and ensure you follow the correct technique for each exercise. Maintain correct posture at all times.

No fooling around - help and respect other athletes

Wear the correct clothing and shoes

No personal stereos with headphones

Only athletes who are working out should be in the weight room

Make sure you are fully aware of the safety rules applying to the weight training room you use.

Remember **BE KNOWLEDGEABLE, BE SAFE**

Planning the Personal Exercise Programme

Name: ______________________ Performance Activity: ______________________ Date: __________

Movement/performance Requirement	Fitness Requirement	Appropriate Fitness Development Method

Part 4 Teaching Resource

‘Concepts & Definitions’

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General Considerations & Objectives

This pack enables a study of the various facets of an individual's physical activity experience – play, recreation, sport and physical and outdoor education. It enables an understanding of the definitions, values and characteristics of those elements and how they inter-relate within individual physical activities. The concept of a physical activity continuum is also explored.

Students are required to develop an understanding of the value and functionality these activities have within contemporary society.

It is intended that students should draw upon their own early and contemporary experiences and relate them to current performance developments through their Personal Performance Portfolio.

Teaching Strategies

1 Ask students to reflect upon and present information about their own physical activity experiences. Engage in discussion with others of the value of physical activity to them, their families and peers.

2 Through physical activity and participation explore the nature of play, recreation, sport and physical education. Take both participant and observer roles.

3 Read and evaluate information from textbooks and government publications.

4 Ask students to prepare information handouts for others, notes for a debate and a presentation on various topics.

From Play to Physical Education

‘Hide & Seek’

Either ask some of the group to play a game of hide and seek, or watch a group of younger children engaged in a playground game at your school. While you are watching fill in the following chart. Use the completed chart as a basis for your group discussions.

1 **Are there rules? How are/were they arrived at?**

2 **Is there a defined playing area? How was it defined?**

3 **Is there a referee/umpire? If not why not? How are disputes resolved?**

4 **Does the activity have a purpose(s)? Which is the most important and why?**

5 **When/how did the activity start/finish? What else might have stopped the activity?**

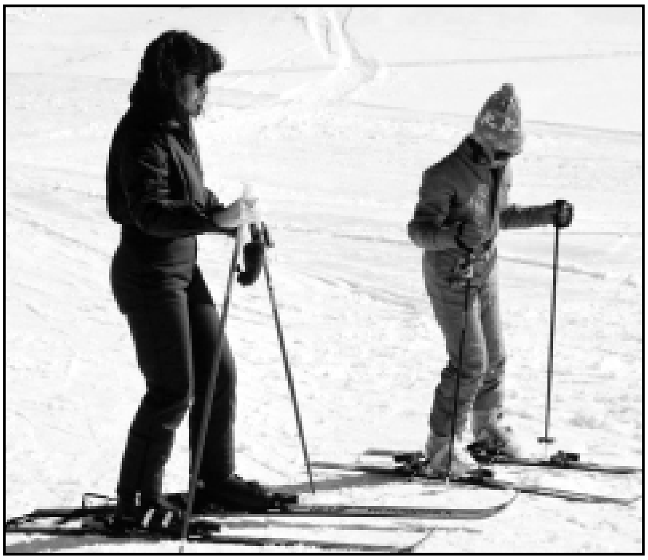
6 **4 groups of people from different social classes wish to participate in this activity. How could this be achieved?**

7 **What would you have to do to enable a national hide and seek competition?**

8 **How would you use your game of hide and seek to achieve an objective(s) appropriate for a PE lesson?**

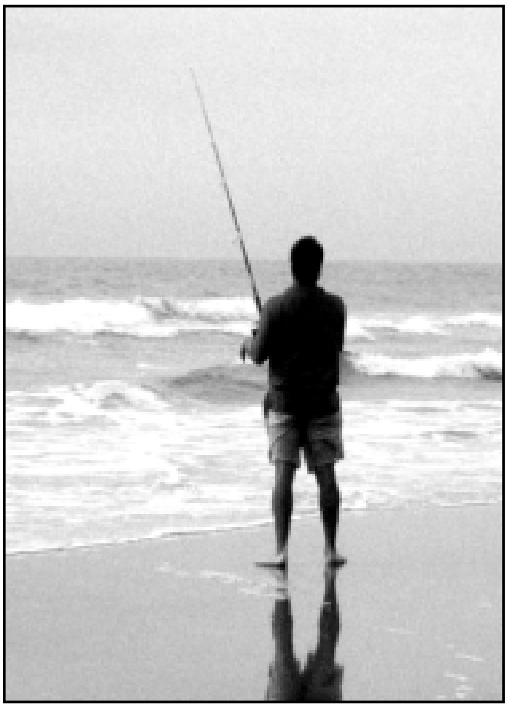
9 **Are the group engaged in a leisure activity, is it physical recreation?**

Adults at Play



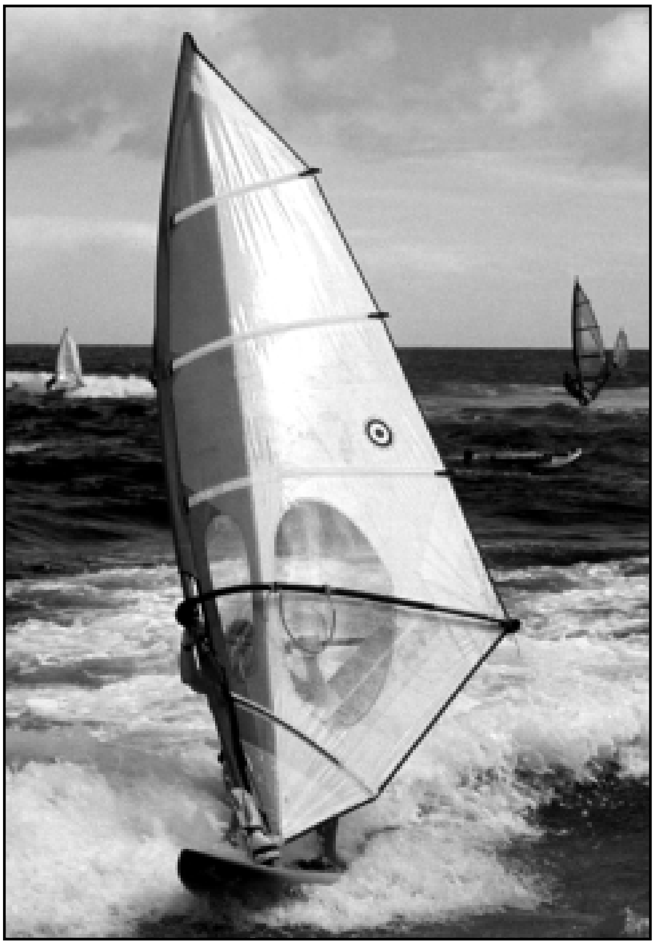
Would the adult and the child be gaining the same experiences here?

Would they be getting the same benefit?



What is this person doing? Why are they doing it?

What might they be gaining by doing it?



How does this activity differ from the other pictures on this page?

Does the nature of the activity affect the benefits to those participating?

Play Observation Chart

Observe a group of children engaged in play. Do you see any of the things in the first column happening? If you do put a ‘Y’ in the second column and then describe in what form you saw it happen - what happened, how did the children react etc. Use the form to help you in your group discussions.

DEFINITION	SEEN Y/N?	FORM/DESCRIPTION
Voluntary Activity		
Time Rules		
Place Rules		
Freely Accepted		
Binding		
Purpose		
Joy, Fun		
Tension		
Fantasy		

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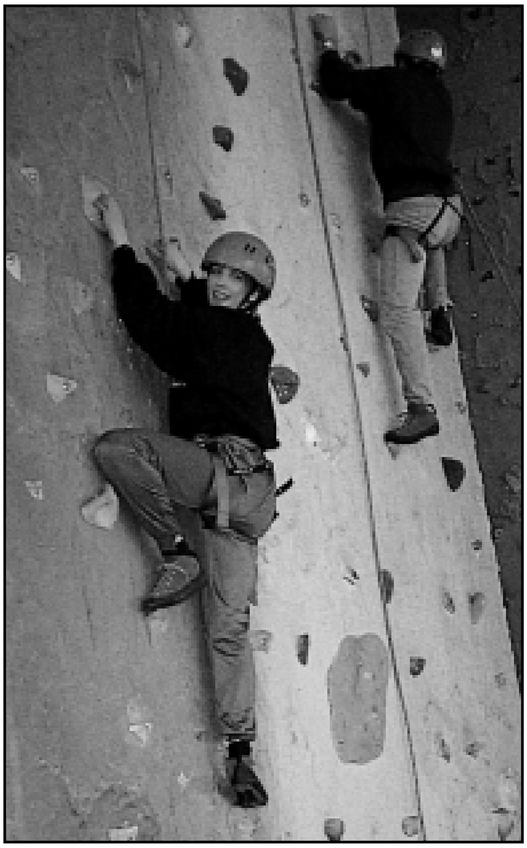
Outdoor Adventure & Education



Decision Making

Danger

Escapism

What is being taught?

Self Reliance?

Trust?

Skills?

Are there Risks?

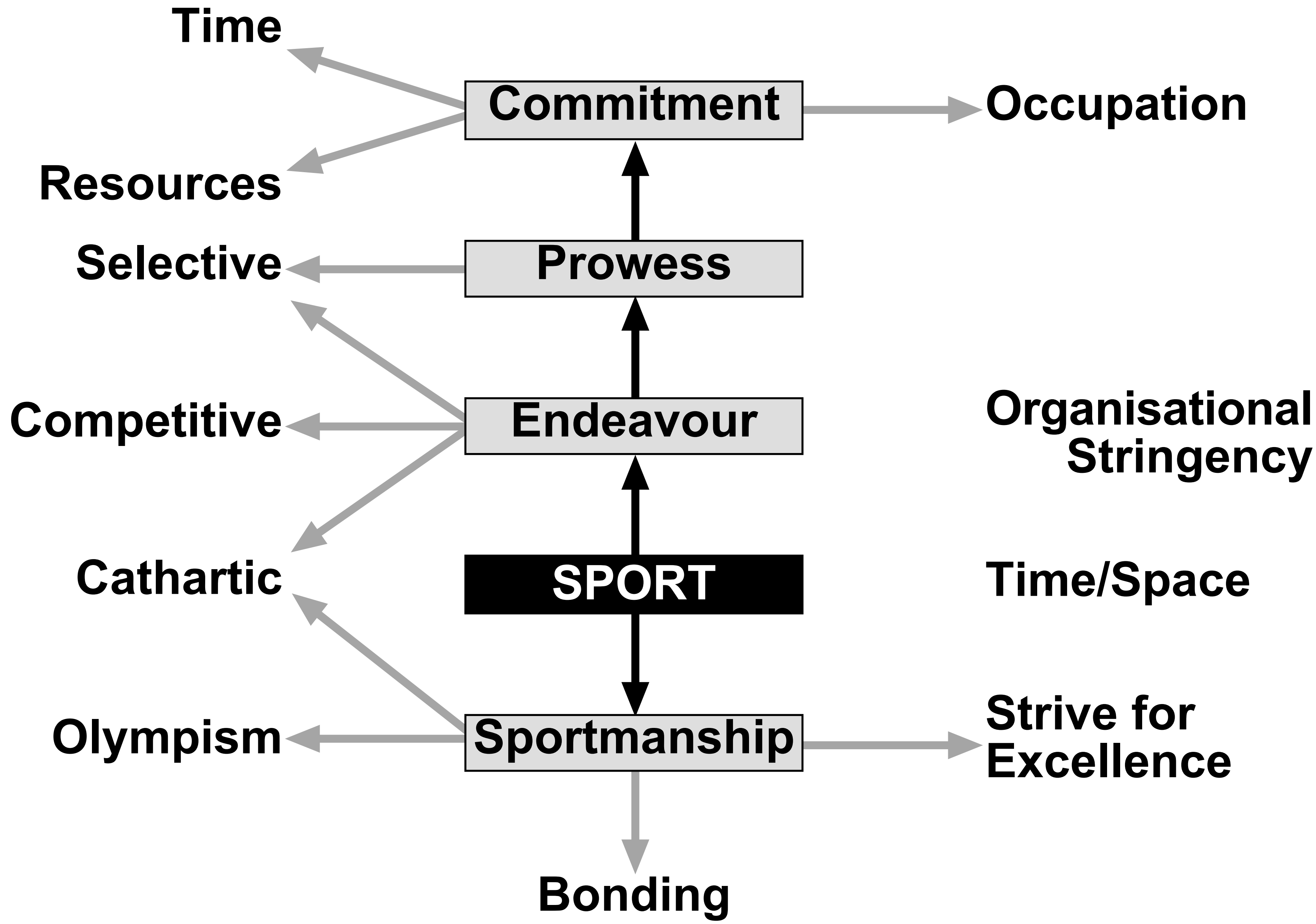
Why seek danger?

Leadership?

Learning?

An Environment for all?

Characteristics of Sport



Time

Commitment

Occupation

Resources

Selective

Prowess

Competitive

Endeavour

Organisational Stringency

Cathartic

SPORT

Time/Space

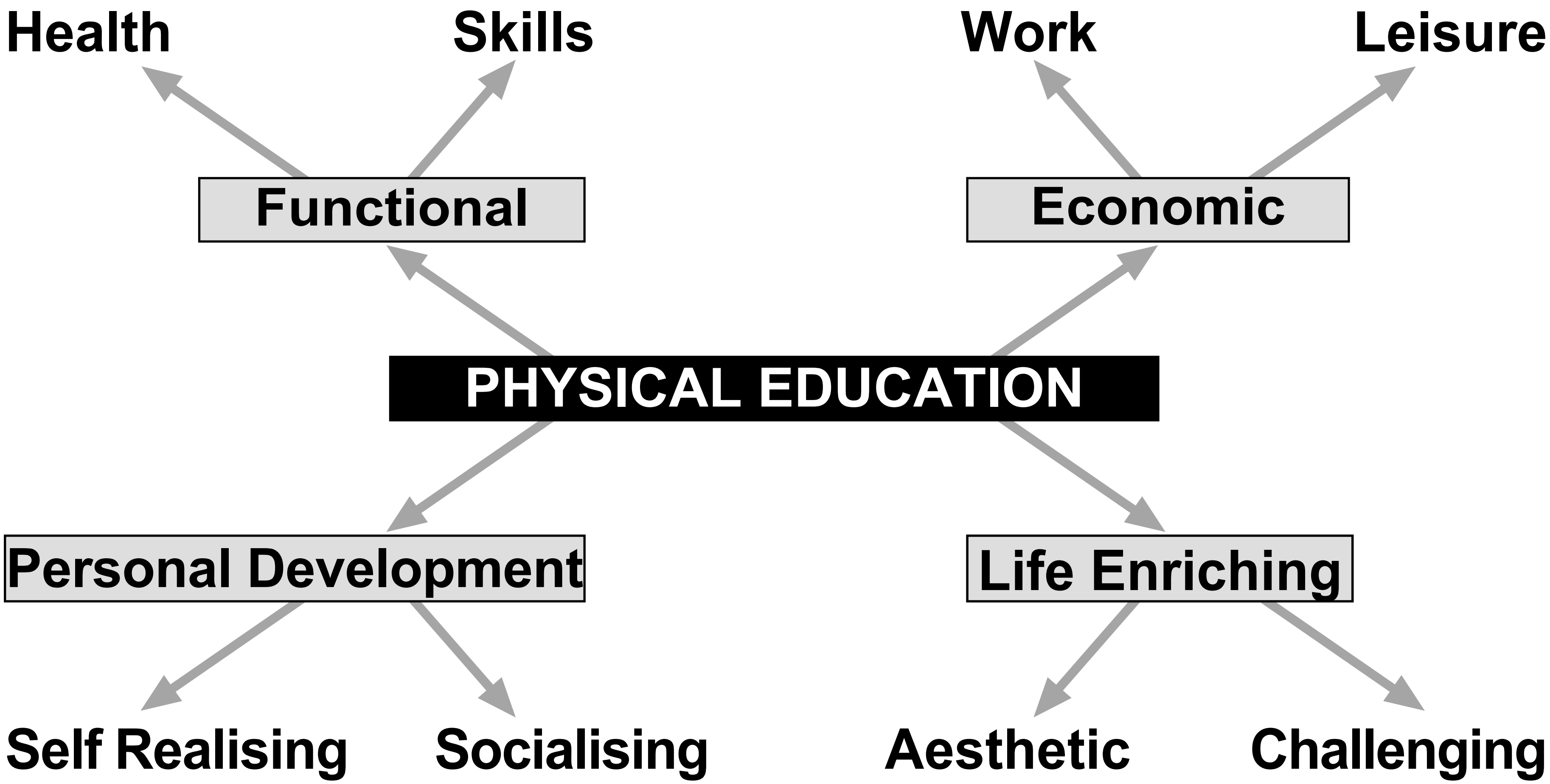
Olympism

Sportmanship

Strive for Excellence

Bonding

Characteristics of Physical Education



PHYSICAL EDUCATION

Functional

Health

Skills

Economic

Work

Leisure

Personal Development

Self Realising

Socialising

Life Enriching

Aesthetic

Challenging

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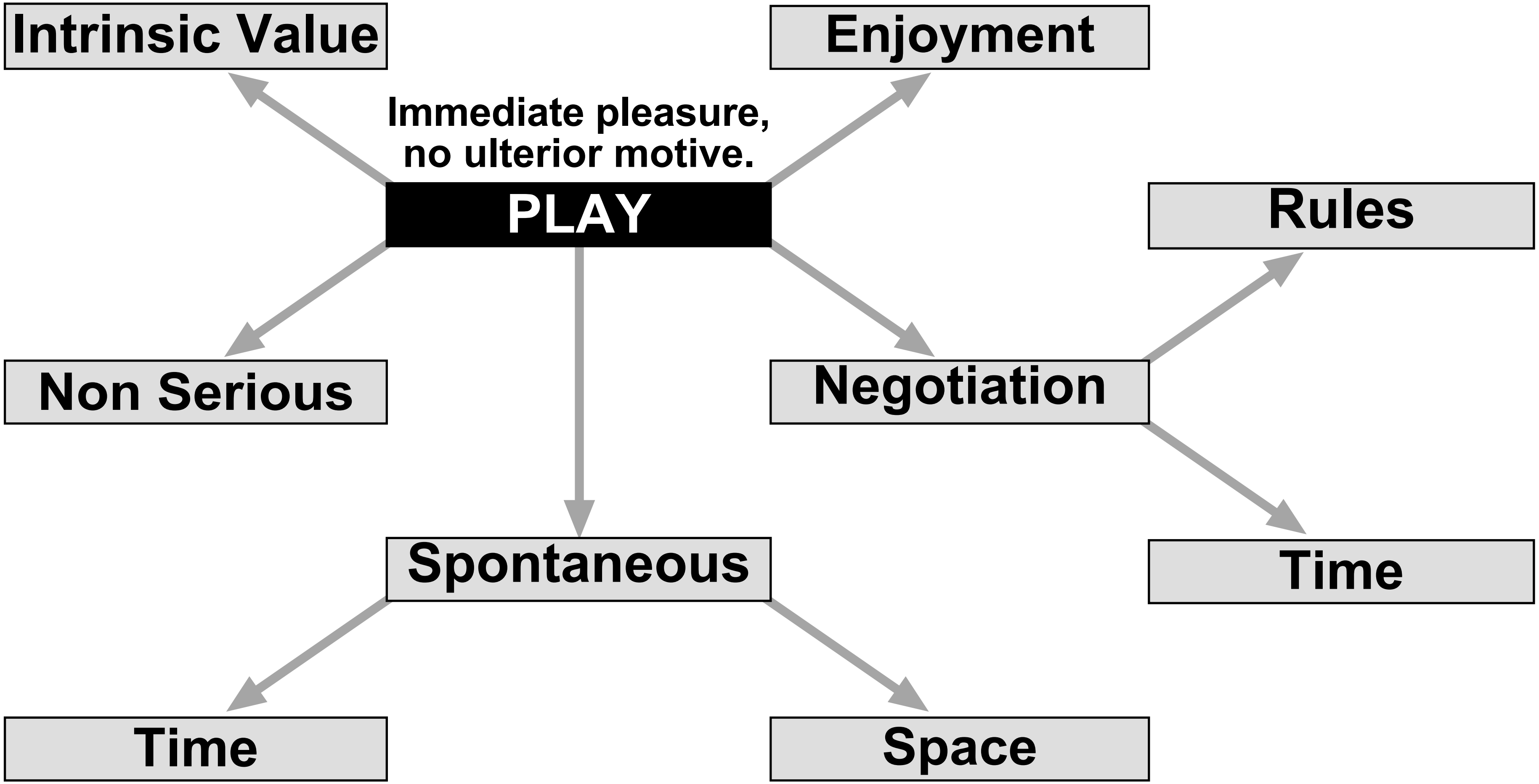
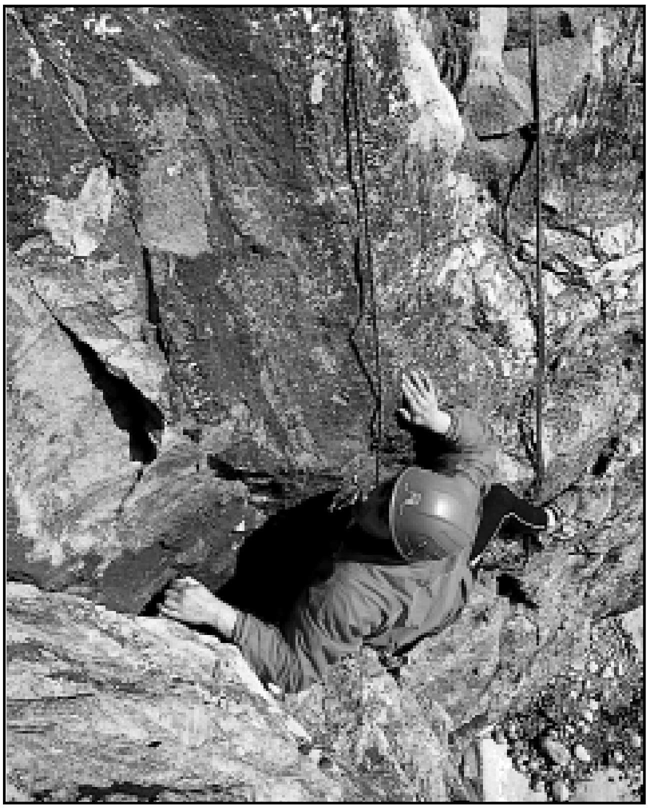
Characteristics of Play

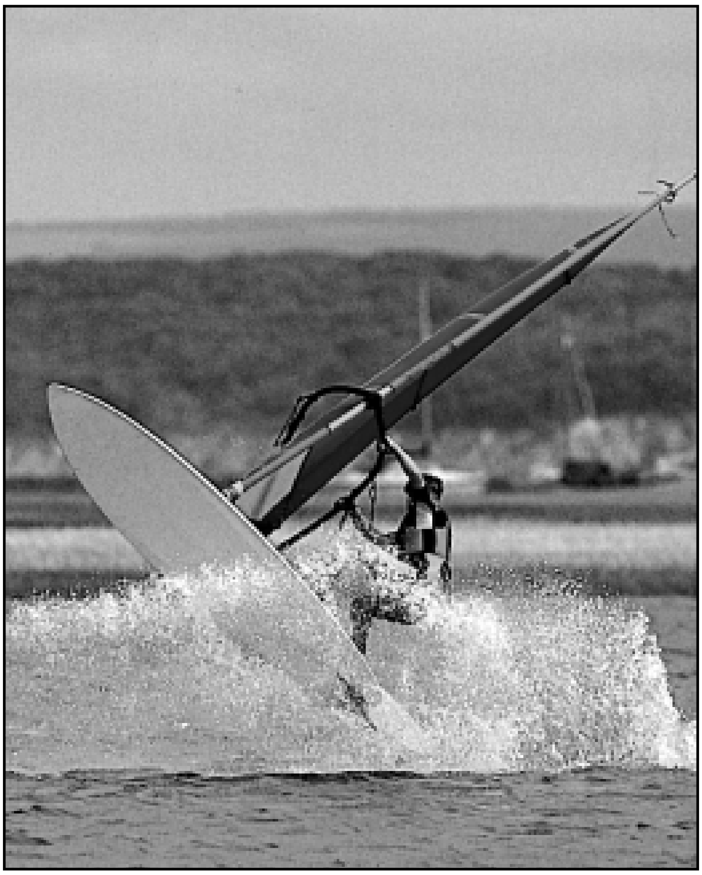


- PLAY
  - Intrinsic Value
  - Enjoyment
    - Immediate pleasure, no ulterior motive.
  - Non Serious
  - Negotiation
    - Rules
    - Time
  - Spontaneous
    - Time
    - Space

Outdoor Adventure & Education



Learning
Decision Making
Self Reliance
Trust
Skills
Leadership



Environmental Awareness
Risk
Danger
Survival
Challenge
Escapism
Adventure

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Part 5 Teaching Resource

Is Leisure a Luxury or a Necessity?

General Considerations and Objectives

It is vital that students gain a clear and unambiguous understanding of the key concepts of leisure, recreation and physical recreation. They will of course have experienced these activities themselves and will know of the local provision and support. Students will need these facts to be able to justify the place of these activities within a society given the economic and human resource support that is given. Students will need to be able to discuss clearly and precisely, with examples, the value that leisure and recreation has for individuals, groups and communities.

Specifically students need to

1 Gain an understanding of the nature and characteristics of leisure, recreation and physical recreation.

2 Determine what value or purpose leisure or recreation may have for individuals or societies/communities. To what extent do all members of society have access to leisure.

3 Meet and gain a basic understanding of some of the theories relating to leisure and recreation.

Teaching Strategy

Begin by using the students own experiences and background knowledge of leisure and recreation and then bring them to a more concise and precise definition. From that basis and using the resource sheets and handouts gradually refine their understanding of the value that society places upon leisure and recreation in terms of individual fulfilment and social healthy.

Students should also be asked to consider whether or not all members of societies or communities have equality of access, and whether a government, local authority or community has any obligation to promote equality of access. This is also a useful link to the later work in Section 11.4. Students should also be asked to consider the concept of purposeful leisure – the concept that leisure must have a purpose either for the individual or the state.

The student tasks indicate the areas in which they need to make notes for later referral. The debate provides a useful mechanism for bringing together their understanding of the topic and its various themes of characteristics, function and provision. The requirement for reach student to provide bullet point notes for each member of the group also ensures that they all do the preparatory work even thy may not be called upon to speak in the debate.

The use of a debate also helps develop skills of speaking in a structured, concise and clear manner. This will also have a spin off in their abilities to write in this way – useful for exams.

continued....

Finally as a practical way of introducing/discussing some of the topics covered in this section of the specification ask the students to do the following: -

a Set up team or individual games of your choice.

b Organise themselves into a 15 minute tournament/match.

c Offer a prize for the winner.

At the end of the tournament get the students to ask themselves the following questions

"Were you taking part in leisure or recreation?"

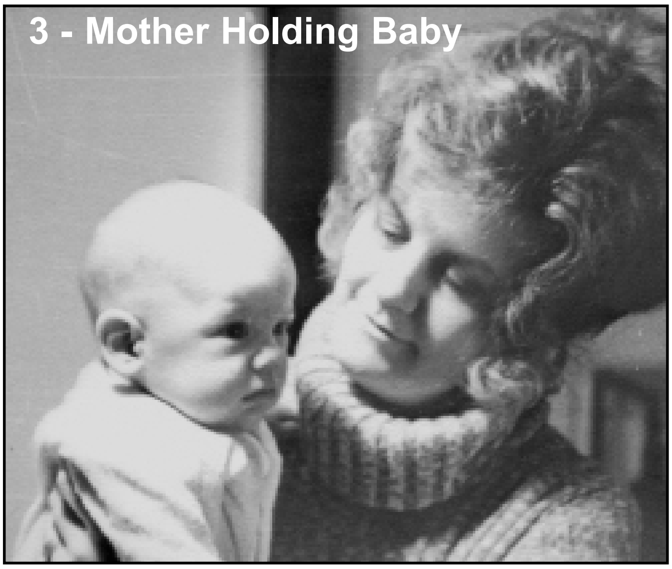
"Did the presence of a prize affect the way you play or whether or not you were engaged in leisure?"

The resource pack also includes OHT's that summarise some of the main characteristics and values connected with leisure and recreation.

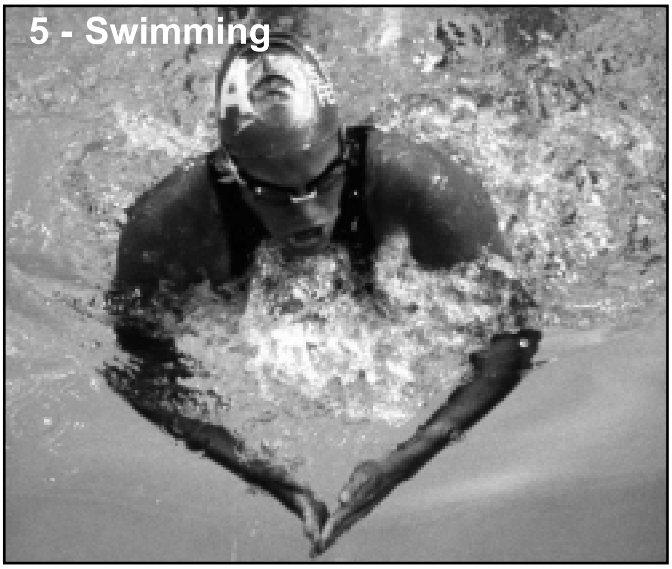
Leisure? Physical Recreation?

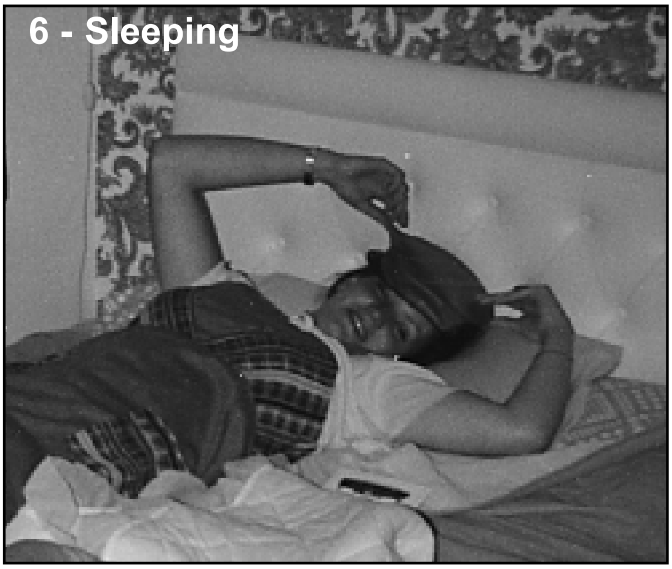
1 - Tennis Professional

2 - Gardening

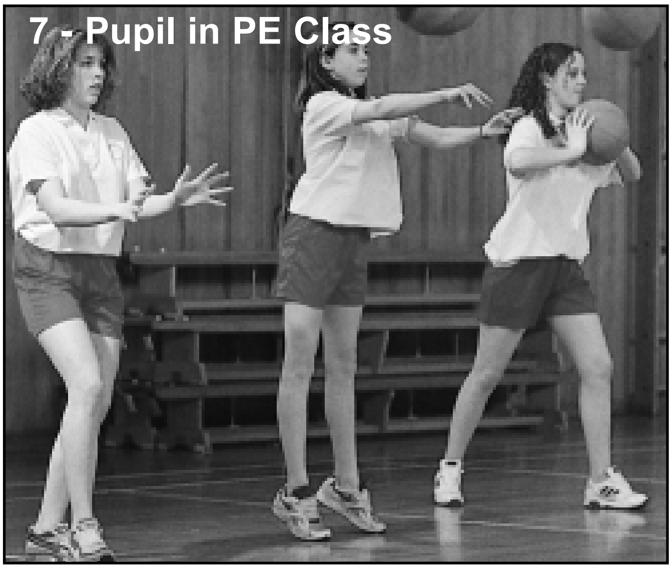

3 - Mother Holding Baby

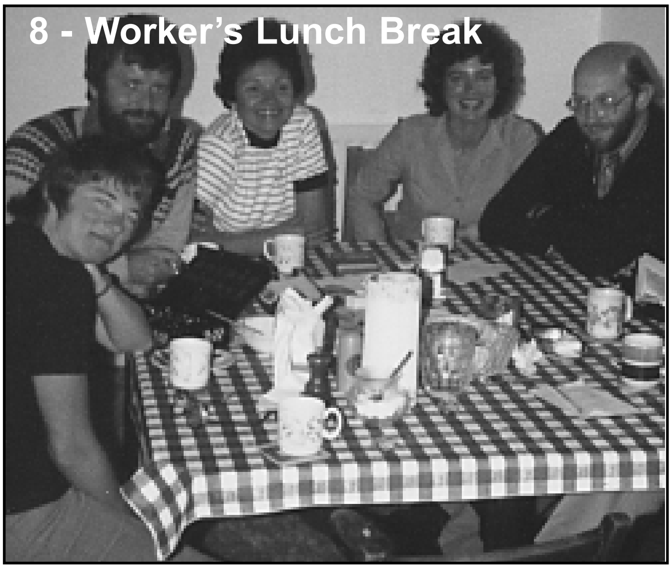
4 - Angling

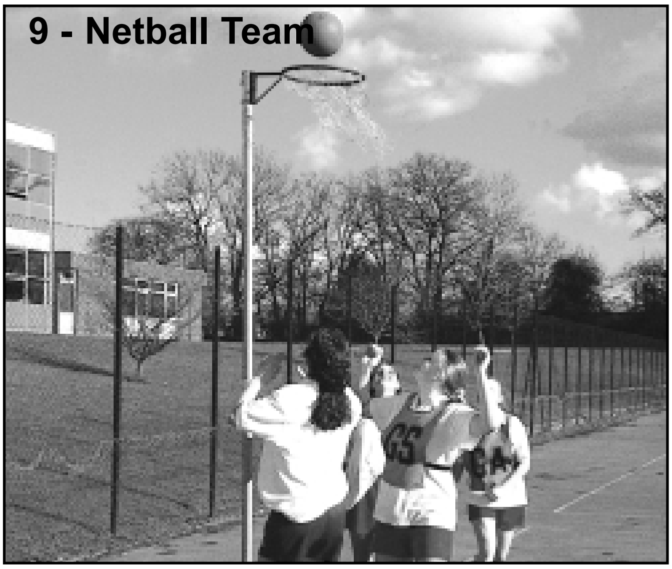

5 - Swimming

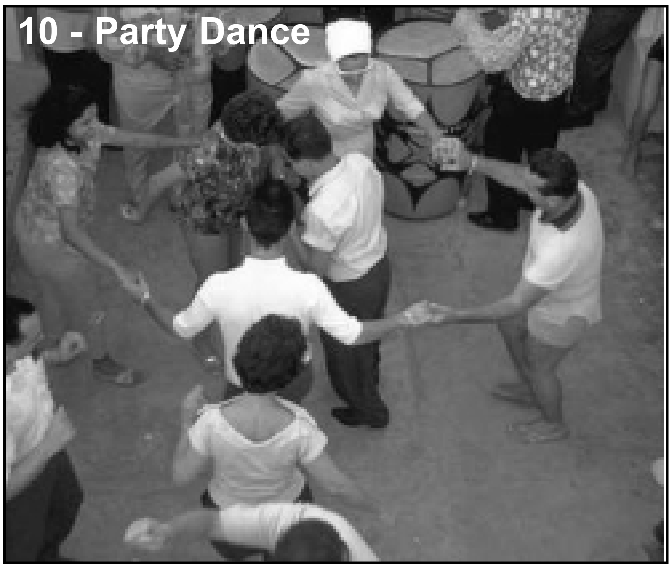

6 - Sleeping

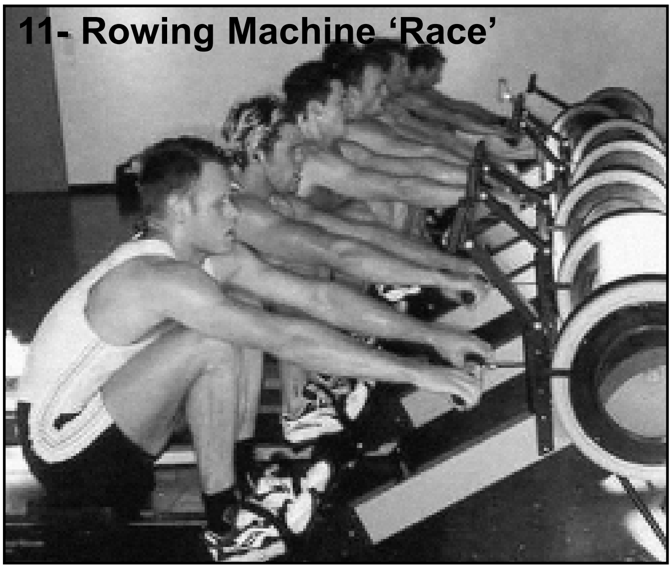
Leisure? Physical Recreation?

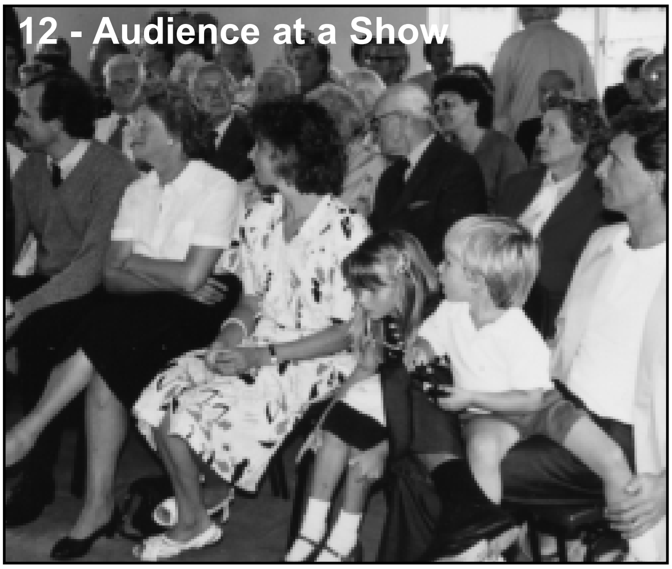

7 - Pupil in PE Class


8 - Worker's Lunch Break


9 - Netball Team


10 - Party Dance


11- Rowing Machine 'Race'


12 - Audience at a Show

Definitions of Leisure

Leisure is a time in which there is an opportunity for choice

Arnold 1968

Leisure helps people to learn how they play their part in society; it helps them to achieve societal or collective aims; and it helps the society to keep together

Parker 1975

Leisure is a mental and spiritual attitude – a condition of the soul, not the inevitable result of spare time.

Pieper 1965

Leisure has 3 functions: relaxation of energies consumed by daily life; free development – compensation for the specialisation of movement and knowledge imposed by modern industrial life and; recreation- relief from the boredom and restrictions of daily life

McDonald 1971

Leisure is the complex of self-fulfiling and self-enriching values achieved by the individual as he uses leisure time in self-chosen activities that recreate him

Miller & Robinson 1963

Leisure – a necessary prerequisite for practising the more civilised virtues – the adoption of a critical attitude to life and developing a taste for excellence

Bell 1947

Leisure is an activity – apart from the obligations of work, family and society – to which the individual turns at will. It has 3 functions – relaxation, entertainment, self-fulfilment

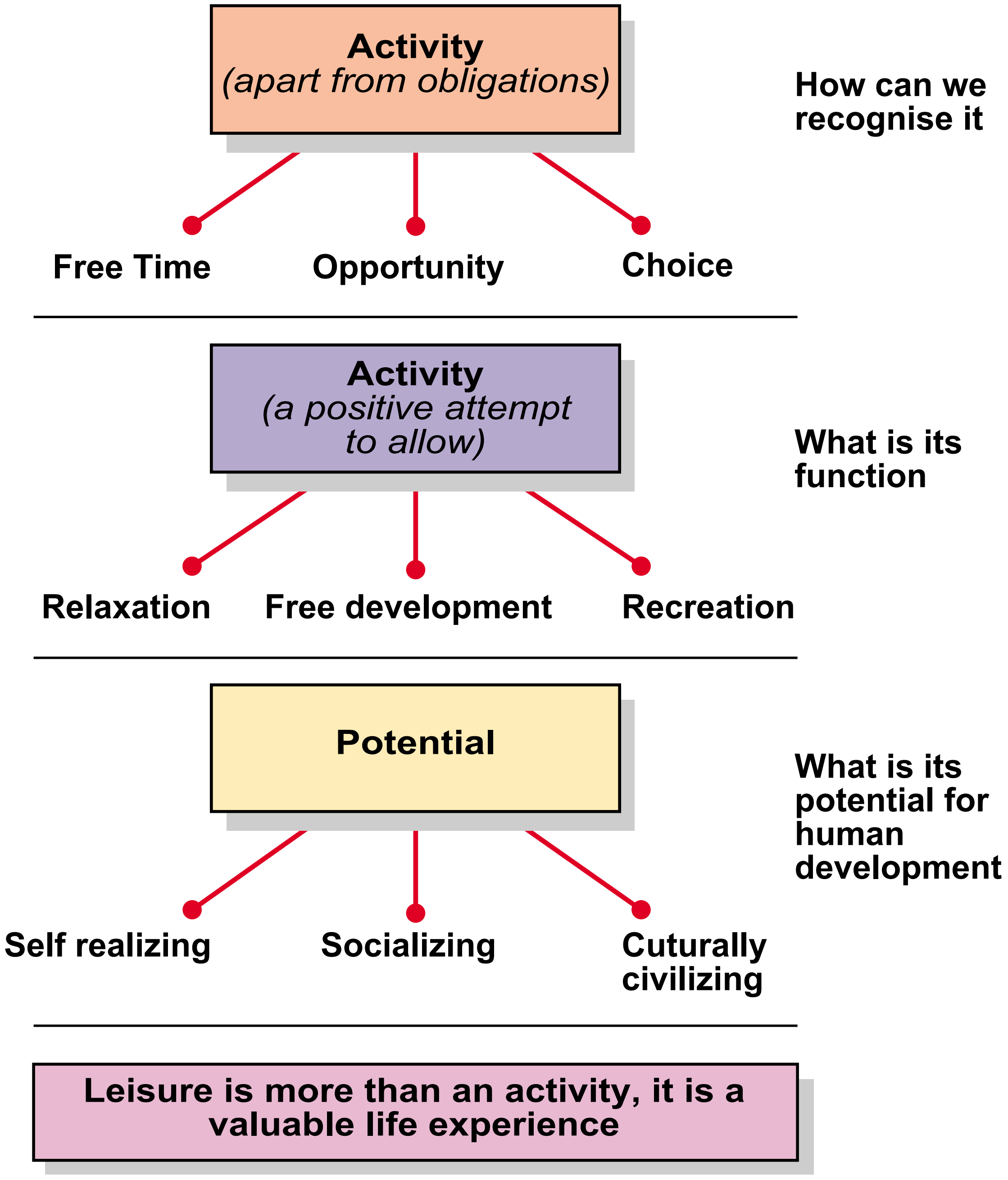
Dumazadier 1967

Leisure – a time when one's true identity can emerge

Leisure – an opportunity for self-expression

J. Pieper, C Brighthill, S de Grazia

Concepts of Leisure



Activity
(apart from obligations)

Free Time

Opportunity

Choice

How can we recognise it

Activity
(a positive attempt to allow)

Relaxation

Free development

Recreation

What is its function

Potential

Self realizing

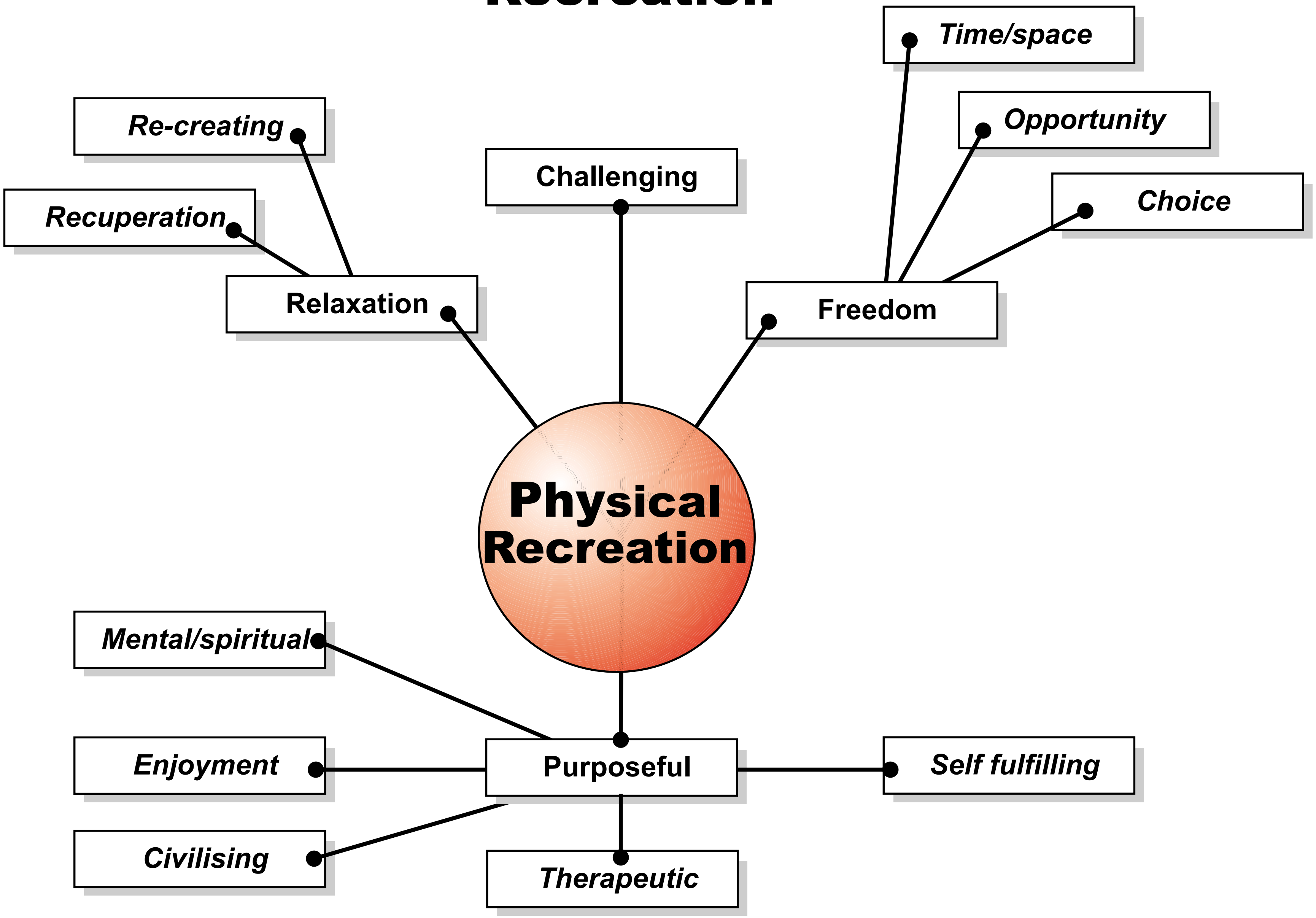
Socializing

Cuturally civilizing

What is its potential for human development

Leisure is more than an activity, it is a valuable life experience

Recreation



Physical Recreation

Re-creating

Recuperation

Relaxation

Challenging

Time/space

Opportunity

Choice

Freedom

Mental/spiritual

Enjoyment

Civilising

Purposeful

Therapeutic

Self fulfilling

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Leisure & Physical Recreation

Response Sheet

PHYSICAL RECREATION?

Image number	Explanation why

LEISURE?

Image number	Explanation why

NEITHER?

Image number	Explanation why

Concepts of Leisure

ACTIVITY

(apart from obligations)

- Free time
- Opportunity
- Choice

How can we recognise it?

ACTIVITY

(a positive attempt to allow)

- Relaxation
- Free development
- Recreation

What is its function?

POTENTIAL

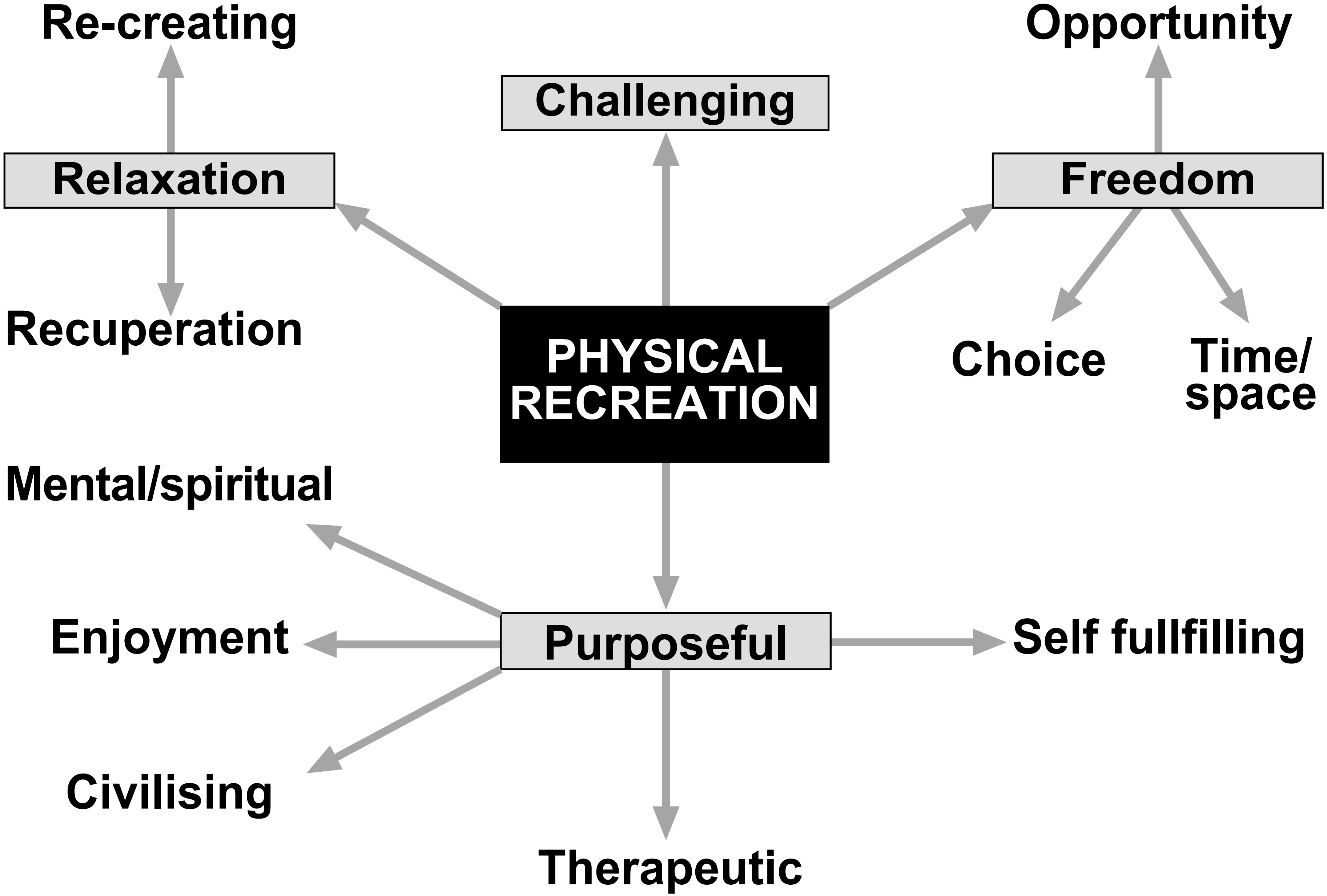
- Self Realising
- Socialising
- Culturally civilizing

What is its potential for human development?

Leisure is more than an activity, it is a valuable life experience

ELTHAM PRESS

Recreation



Re-creating

Opportunity

Challenging

Relaxation

Freedom

Recuperation

PHYSICAL RECREATION

Choice

Time/ space

Mental/spiritual

Enjoyment

Purposeful

Self fullfilling

Civilising

Therapeutic

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Part 6 Teaching Resource ‘Movement analysis’

General Considerations and Objectives

1 To permit students to acquire knowledge of muscle actions of specific movements

2 To allow students to understand the link between joint structure, muscle action, muscle function and movement

3 To understand movement in relation to planes and axes of the body

4 To enable students to be able to apply this acquired knowledge to the introduction of their Personal Exercise Plan.

Tasks

In this study pack you will find a range of tasks requiring the students to analyse a number of common movements. They will need to:

- Identify the bones involved
- Determine the joint type
- Identify the muscles involved and their location, function and action
- Understand types of muscle contraction involved with common sport movements of the joint

All the tasks require them to work from practical experience – do the movement, observe and study others. They will find the use of a video camera useful in this respect particularly if there is a slow motion option.

The students are also required to work with others when determining joint and muscle actions.

The student's work could simply be assessed as answers to questions, or it may be assessed as part of a groups work, or through class discussion. The analysis of movement is an important consideration in the determining of the Personal Exercise Plan.

Be prepared to answer questions and to make suggestions.

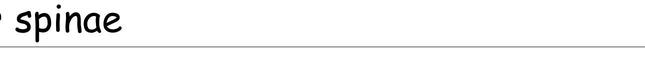
A list is provided of a number of suitable textbooks. Your centre may also have suitable posters, videos that will help. Always remember that the teacher is ultimately the best resource. Independent learning does not mean don't ask me!

Task 1 Analysis of Breastroke

Answers

a Observe a video or a drawn action sequence of a performer swimming breaststroke. Read through the following description of the techniques and answer the questions concerning the movements involved in the spaces provided.

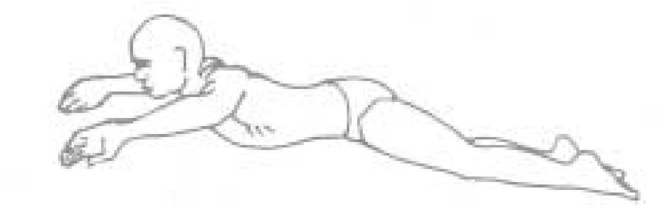
In breaststroke, the pull of the arms consists of an outward and inward sculling motion of the hands. Each hand follows the same line. From the side, the body is streamlined (straight) and submerged with the head facing down.



b Name the muscles in the back that keep the body in this streamlined position:

Erector spinae

The thighs move upward to lift the legs, the hands scull to a point just wide of the shoulders. The head and shoulders, in unison lift gradually.



c As the thighs move upward, what action is involved at the hips, and which muscles are involved? What are the origins and insertions of these muscles?

Hip joint

Action = Flexion
Main agonist 1 = Iliopsoas
Origin = Lumbar vertebrae & Iliac crest
Insertion = Femur
Main agonist 2 = Rectus femoris
Origin = Iliac spine
Insertion = Patella tendon

d Name the bones that form the hip joint and the type of joint involved.

Hip joint

Bones Femur & Ischium of pelvic girdle
Type of joint Ball & Socket

e Which muscle in the forearm causes pronation of the hand? Where does this muscle originate and insert

Forearm

Action = Pronation

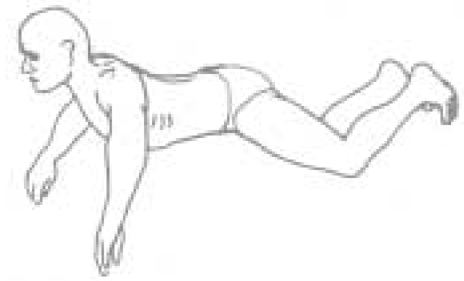
Main agonist = Pronator Teres

Origin = Medial epicondyle of humerus,

Coronoid process of ulna

Insertion = Radius

The trunk rises as the elbows bend sharply and the hands change direction inwards before there can be any tendency to pull backward. The hands move inwards almost on the same line as the inward scull. The leg recovery starts as the knees bend.



f The arm action involves medial rotation of the arm. Which are the main agonists in this action? Name their origin and insertion.

Forearm

Action = Medial rotation

Main agonist 1 = Subscapularis

Origin = Subscapula fossa of scapula,

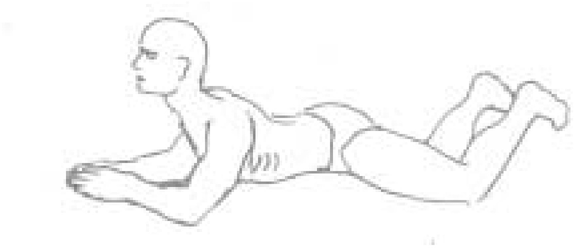
Insertion = Lesser tubercule of humerus

Main agonist 2 = Teres major

Origin = Inferior angle of scapula

Insertion = Distal to lesser tubercule of humerus

The bent arms are drawn vigorously inwards as the pull ends. The hands continue forward, the head clears the water as the trunk in elevated. The hips push downwards, causing the legs and feet to lift.



g The inward pull of the arms involves the latissimus dorsi and the pectoralis major as the main agonists. Name the origin and insertion of these muscles.

Forearm

Action = Inward pull of arms

Main agonist 1 = Latissimus dorsi

Origin = Spines of thoracic, lumbar and sacral vertebrae,

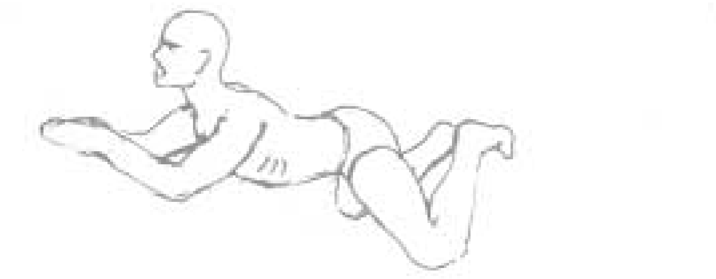
Insertion = Intertubercular groove of humerus

Main agonist 2 = Pectoralis major

Origin = Clavicle , Sternum & Rib cartilages

Insertion = Greater tubercule of humerus

The shoulders and upper back are clear of the water and the swimmer inhales without needing to consciously lift the head. The deep knee flexion brings the heels close to the buttocks with the feet remaining just below the surface.



h Name the muscles, together with their origins and insertions, that cause flexion at the knee.

Knee

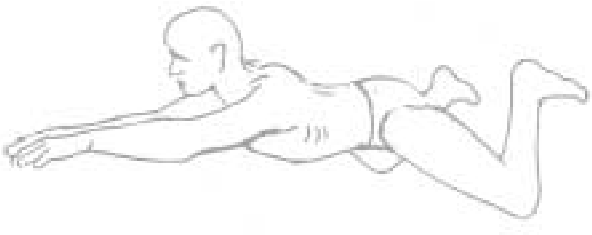
Main agonist 1 = Biceps femoris,
Origin = Ischial tuberosity; Femur,
Insertion = Head of femur & Lateral condyle of tibia,
Main agonist 2 = Semitendinosus
Origin = Ischial tuberosity
Insertion = Proximal medial tibia,
Main agonist 3 = Semimembranosus
Origin = Ischial tuberosity
Insertion = Medial condyle of tibia

i The arms move through lateral rotation. Name the main agonists involved and their origins and insertions.

Arms

Action = Lateral rotation,
Main agonist 1 = Infraspinatus
Origin = Fossa inferior to spine of scapula
Insertion = Greater tubercule of humerus,
Main agonist 2 = Teres minor
Origin = Lateral border of scapula
Insertion = Greater tubercule of humerus

The arms extend forward with the shoulders following to enable the swimmer to obtain a long reach. The feet are dorsi flexed as the kick starts.



j What actions take place at the shoulder and elbow during this phase? Name the main agonists involved.

Elbow joint

Action = Extension

Main agonists = Triceps brachii

Shoulder joint

Action = Adduction

Main agonists = Deltoids

k Name the muscle causing dorsi flexion. What are its origin and insertion?

Foot

Action = Dorsi flexion

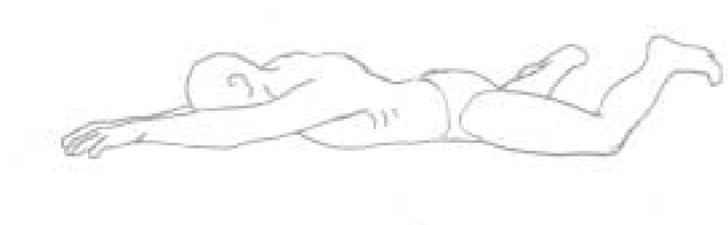
Main agonists = Tibialis anterior

Origin = Lateral condyle & body of tibia

Insertion = First metatarsal &

First cuneiform of foot

The hips extend, causing thighs and buttocks to lift in reaction. The leg drive is near completion; the feet accelerate through this most powerful phase of the kick.



I What is the name of the action taking place at the knee in this phase? Which muscles are the main agonists? Name their origins and insertions.

Knee

Action = Extension

Main agonist 1 = Rectus femoris

Origin = Anterior inferior Iliac spine

Insertion = Patella

Main agonist 2 = Vastus lateralis

Origin = Greater trochanter & Linea aspera of femur

Insertion = Patella ligament to tibia

Main agonist 3 = Vastus medialis

Origin = Linea aspera of femur

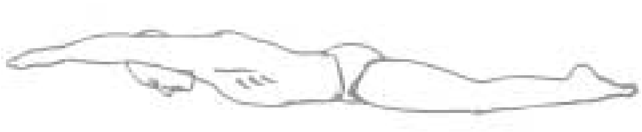
Insertion = Patella ligament to tibia

Main agonist 3 = Vastus intermedialis

Origin = Surfaces of femur

Insertion = Patella ligament to tibia

The body is streamlined and mostly/all submerged during a short glide that takes it beneath the turbulent surface water.



m What action has occurred at the hip leading to this phase? Name the agonists concerned and their origins and insertions.

Hip

Action = Adduction

Main agonist 1 = Adductor longus

Origin = Pubic crest and pubis symphysis

Insertion = Linea aspera of femur

Main agonist 2 = Adductor brevis

Origin = Inferior ramis of pubis

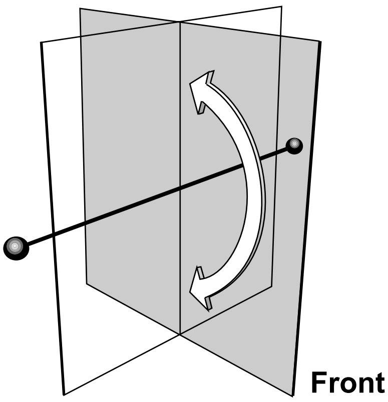
Insertion = Upper linea aspera

Main agonist 3 = Adductor magnus

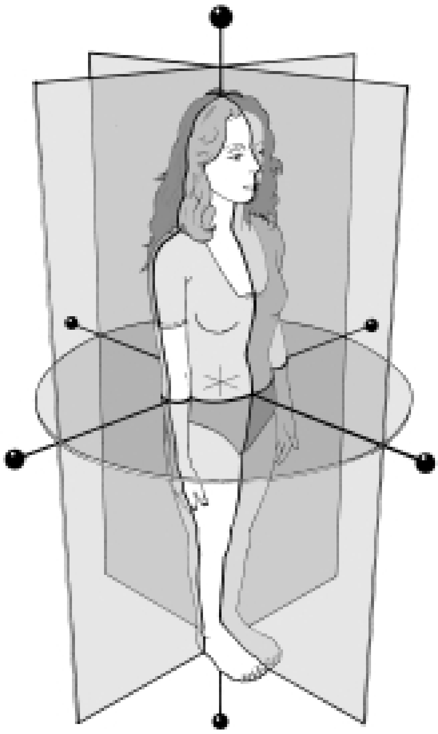
Origin = Inferior ramis of pubis & ischium

Insertion = Pectineal line of femur

Task 2 Analysis of Sprinting
Answers



Side to side *(transverse)* axis, involved in movement in the sagittal plane known as **flexion** and **extension**, e.g. bending *(flexion)* and straightening *(extension)* the arm at the elbow.



The leg action in running is one that takes place in a **sagittal plane** about a **transverse axis**. The actions are concerned with three joints, the hip, knee and ankle.

Drive Phase

During the time the foot is in contact with the floor, the drive of the leg is achieved through contractions of muscles causing movement at all three joints.

At the hip, a **ball and socket** joint is formed by the **femur** and **acetabulum** of the **pelvic girdle**, there is a powerful **extension** and **hyperextension**, brought about by the action of the muscles of the **hamstrings** group (biceps femoris, semitendinosis and semimembranosus) and the **gluteal** muscles (gluteus maximus and minimus).

At the knee, a **hinge** joint formed from the **tibia** and **femur**, there is **extension**, mainly as a result of the action of the **quadriceps** group of muscles (rectus femoris, vastus medialis, vastus lateralis and vastus intermedialis).

At the **ankle**, a **hinge** joint formed by the **tibia** and **calcaneus**, there is **plantar flexion**, brought about principally by the action of the **gastrocnemius**. The soleus muscle has the same action but is predominantly concerned with the maintenance of posture

Recovery phase

At the hip, the **hip flexors**, which in this movement include the **iliopsoas** and **quadriceps** group, cause **flexion**. At the knee, the **hamstrings** group (working with gravity) produces **flexion**. At the ankle, the **tibialis anterior** causes **dorsiflexion**.

a Observe a live or video recording of a sprinter. Try to make sure that you see a side-on view of the leg actions taking place.

b Review the leg actions, and making use of your own knowledge and/or the textbooks and information provided answer the following questions.

c Through which plane and axis do the leg actions take place?:

The leg action in running is one that takes place in a sagittal plane about a transverse axis.

d Considering only the leg actions, name the three joints that are involved:

1 Hip
2 Knee
3 Ankle

continued....

e For each joint, complete the table to name the bones that are involved (articulating) and the type of joint that is formed:

1 Joint Hip
Articulating Bones = Femur & pelvic girdle
Type of Joint = Ball & socket
2 Joint Knee
Articulating Bones = Femur & tibia
Type of Joint = Hinge
3 Joint Ankle
Articulating Bones = Tibia & calcaneus
Type of Joint = Modified hinge

Each of these joints produces two actions, one when the leg is in contact with the ground (the driving action) and one when the leg is not in contact with the ground (the recovery action).

f Complete the following table:

1 Joint Hip
Action during drive = Extension & hyperextension
Action during recovery = Flexion
2 Joint Knee
Action during drive = Extension
Action during recovery = Flexion
3 Joint Ankle
Action during drive = Plantar - flexion
Action during recovery = Dorsi - flexion

continued....

g Name the muscles that act as the agonist for each of these actions to complete the following table:

1 Joint Hip

Action during drive = Extension & hyperextension

Muscles acting as agonists = Gluteal muscles (gluteus maximus & gluteus minimus) & Hamstrings (biceps femoris, semimembranosus, semitendinosus)

Action during recovery = Flexion

Muscles acting as agonists = Iliopsoas

2 Joint Knee

Action during drive = Extension

Muscles acting as agonists = Quadriceps group of muscles (rectus femoris, vastus medialis, vastus lateralis & vastus intermedialis)

Action during recovery = Flexion

Muscles acting as agonists = Hamstrings (biceps femoris, semimembranosus, semitendinosus)

3 Joint Ankle

Action during drive = Plantar - flexion

Muscles acting as agonists = Gastrocnemius. The soleus muscle has the same action but is predominantly concerned with the maintenance of posture.

Action during recovery = Dorsi - flexion

Muscles acting as agonists = Tibialis anterior

Task 3 Analysis of a Press Up Movement

Answers

a Observe another member of your class performing a press up. Note that there are two 'styles' of press up – one with the hands approximately shoulder width apart, and one where the hands are wider apart and parallel to the shoulders.

b Observe both types of movement. Try to analyse the movements occurring at the elbow and at the shoulder. What types of movement are they?

At the elbow the actions are bending and straightening - flexion and extension. At the shoulder the actions are moving forwards and backwards - horizontal flexion and extension - some texts refer to this as horizontal abduction and horizontal adduction.

c Perform the movements yourself. There are several phases.

The first phase is where the arms are straightened. Perform the narrow-arm action, and watch others performing. Try feeling a partner's upper arm, and try to decide which muscles are working (working muscles are contracting and therefore are firm to touch). Think about the muscles in the upper arm. Which ones are contracting in this phase?

Muscle at the back of the arm - Triceps brachii

continued....

d The second phase is called the front support position. This involves no movement, but a held, static position. What type of muscle contractions enables a static position to be held?

Isometric or static contractions

e The next phase is when the body is lowered to the ground.

Through performing the movement of a narrow-arm press-up, and through feeling a partner's muscles, try to decide which muscle in the upper arm is working.

Muscles at the back of the arm - Triceps brachii

f Try the wide arm press up – which muscles are working?

Tends to use the chest muscles - Pectoralis major

g Think about, or feel muscles at the front and back of the chest during the upward phase. Which of these are working?

Chest muscles - Pectoralis major

h Now try the downward phase. Which muscles are working?

Same muscles - Pectoralis major

i Finally complete the work sheet on the next page by filling in the missing words

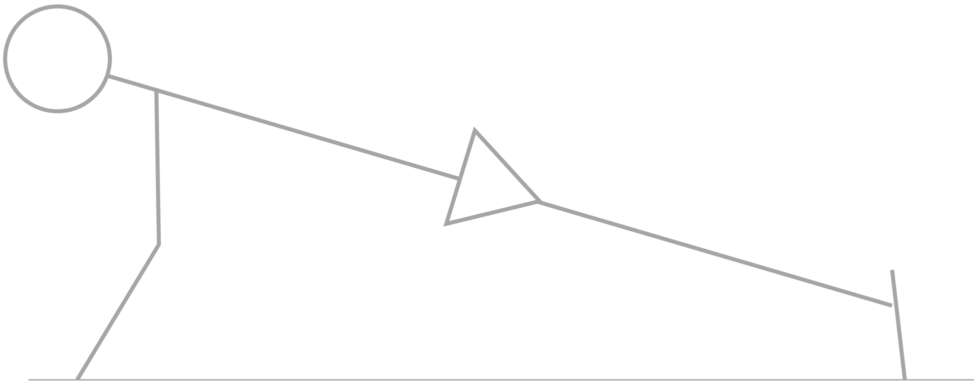
Fill in the missing words from this list provided

Eccentrically - Transverse - Upward - Uniaxial - Longitudinal - Pectoralis major - Ball and socket - Downward - Adduction - Concentrically - Sagittal - Transverse - Fixators - Triceps brachii - Extension

A variety of Fixators hold the head, back and legs in a straight line.

Shoulder joint - Ball & socket joint - triaxial, movement in three planes.

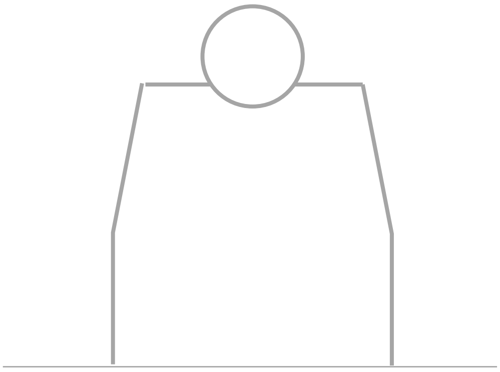
Elbow joint - hinge joint - Uniaxial , movement in one plane.

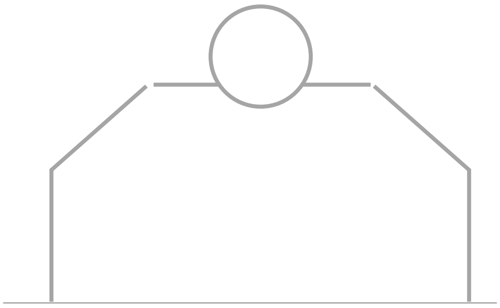


Action at elbow - emphasised in a narrow-arm push up - is flexion during the Downward movement, and Extension in the upward movement.

The main agonist is the Triceps brachii, working Eccentrically during flexion and concentrically during Extension .

These movements take place in a Sagittal plane around a Transverse axis.





Action at shoulder - emphasised in a wide-arm push up - is that of horizontal adduction in the Downward movement, and horizontal abduction in the Upward movement.

The main agonist is the Pectoralis major , working eccentrically during Adduction and Concentrically during abduction.

These movements take place in the Transverse plane around a Longitudinal

Task 4 Analysis of a Squat

Answers

a Observe the leg action of a classmate performing a squat. Note that there are two distinct phases, the downward phase and the upward phase. (Please note if your are not experienced lifters of free weights use a very light weight, or just a bar)

Observe the action from side on. Basing all actions on the starting position, describe in your own words what happens at the following joints during the movement:

Hip Bends & straightens - flexion & extension

Knee Bends & straightens - flexion & extension

Ankle Bends & straightens - dorsi & plantar flexion

continued....

b Which plane and axis are these movements being performed in?:

Movements take place in the Sagittal plane around a transverse axis

c Bending movements in a saggital plane are called **flexion**, whilst straightening movements are called **extension**. Complete the following table to show your understanding of the actions involved in a squat.

Table 1

Hip joint

Downward Action = Flexion

Upward action = Extension

Knee joint

Downward Action = Flexion

Upward action = Extension

Ankle joint

Downward Action = Flexion - dorsi - flexion

Upward action = Extension - plantar - flexion

d Again observe a classmate performing a squat. Movements are occurring at three different joints (hip, knee and ankle). Concentrate on the knee. Place your hands on the subjects thigh, with one hand on the front of the thigh and one on the back of the thigh.

e Which muscles are contracting/working when the subject is moving in the downward phase, in other words during flexion at the knee?:

Muscles at the front of the thigh - quadriceps group

continued....

f Which muscles are contracting in the upward phase, in other words during extension at the knee?:

Same muscles - front of thigh - quadriceps group

g You should find that the same muscle group – the ones at the front - are contracting during both phases. If not try again.

What is the name of this group of muscles?:

Quadriceps - contains rectus femoris, vastus medialis,vastus lateralis and vastus intermedialis

h The difference between the two movements is that during one the contracting muscle is working and getting shorter, whilst in the other, the contracting muscle is working but getting longer. The muscle has to control the descent of the body against the force of gravity.

A contraction of a muscle where the muscle contracts and shortens is called a **concentric** contraction. A contraction of a muscle where the muscle is lengthening is called an **eccentric** contraction.

Does the eccentric contraction occur during the downward or upward phase of the squat?:

Downward

All downward movements involve eccentric contractions of the agonist muscle controlling descent against the force of gravity.

i A similar situation occurs at the hip. What is the name of the muscle(s) that cause extension at the hip?:

Gluteal muscles (gluteus maximus) and hamstring group

continued....

j These muscles work both concentrically and eccentrically to cause the hip to flex and extend. Can you link the two movements to the muscle actions?:

Flexion at the hip during a squat involves a
Eccentric contraction of the gluteal muscles.

Extension at the hip during a squat involves a
Concentric contraction of the gluteal muscles.

k This idea may be repeated for the ankle joint. What is the name of the muscle that causes plantar flexion at the ankle?:
Calf muscle - gastrocnemius

l These gastrocnemius muscles work both concentrically and eccentrically to cause the ankle to plantar-flex and dorsi-flex. Can you link the two movements to the muscle actions?:

Plantar flexion at the ankle during a squat involves a
Concentric contraction of gastrocnemius muscles.

Dorsi flexion at the ankle during a squat involves a
Eccentric contraction of gastrocnemius muscles.

continued....

m Now complete the following table:

Table 2

Hip joint

Downward Action = Flexion
Agonist = Gluteals
Type of contraction = Eccentric
Upward Action = Extension
Agonist = Gluteals
Type of contraction = Concentric

Knee joint

Downward Action = Flexion
Agonist = Quadriceps
Type of contraction = Eccentric
Upward Action = Extension
Agonist = Quadriceps
Type of contraction = Concentric

Ankle joint

Downward Action = Dorsi flexion
Agonist = Gastrocnemius
Type of contraction = Eccentric
Upward Action = Plantar-flexion
Agonist = Gastrocnemius
Type of contraction = Concentric

Task 5 Analysis of Throwing
Answers

Watch a performer throwing a javelin or a ball overarm – either live or using a VCR.

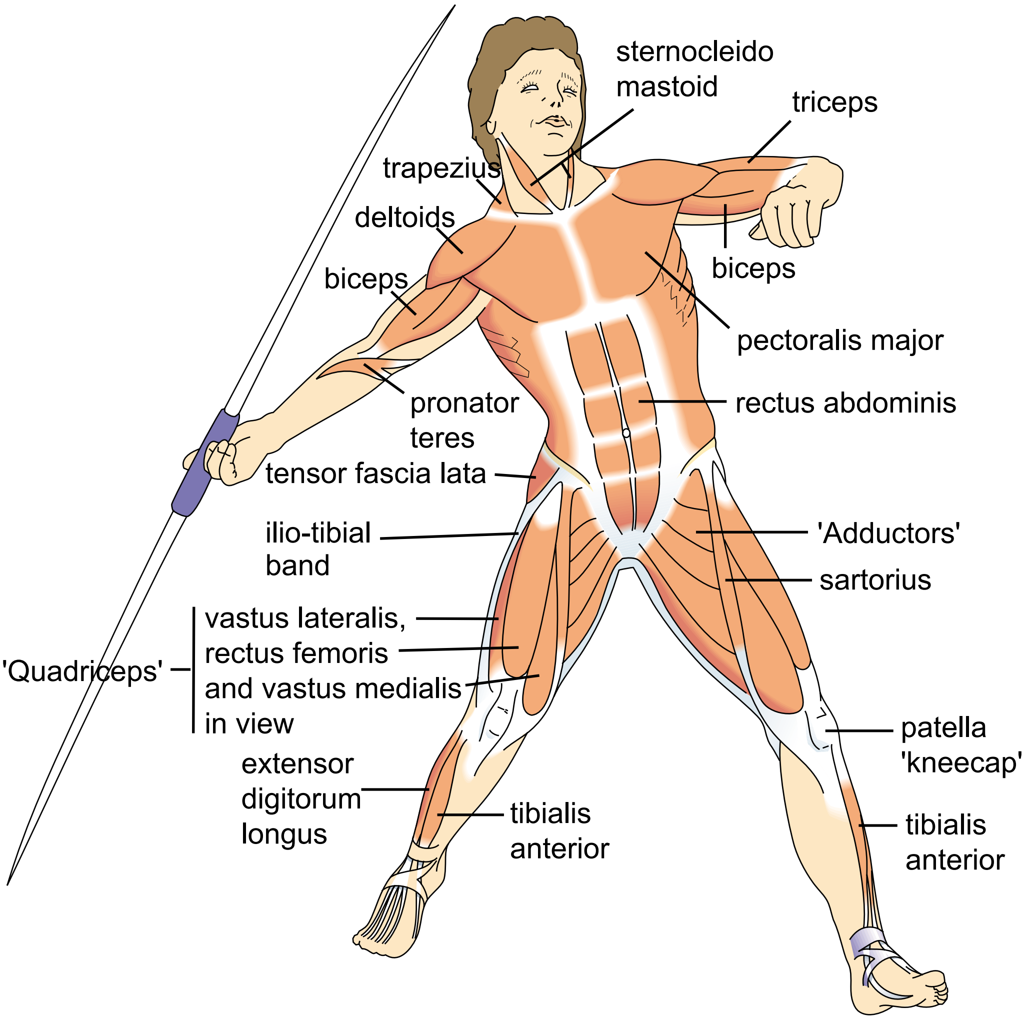
We are only concerned with the arm action. This occurs in two phases, a preparatory and a throwing phase.

In overarm throwing, there are two phases, the preparatory phase, and the throwing phase, both involving actions at the **shoulder**, and the **elbow**.

Taking the arm back in preparation involves **extension** at the **elbow**. The elbow is a **hinge** joint formed by the **humerus** and **ulna**. **Extension** is produced by the actions of the **triceps brachii** muscle.

At the **ball and socket** joint formed between the **humerus** and the **scapula**, there is **horizontal hyperextension** of the shoulder caused by the action of the **posterior deltoid**, assisted by the **latissimus dorsi**.

The throwing phase involves **flexion** of the **elbow** due to the action of the **biceps brachii** and **horizontal flexion** at the **shoulder**, caused by the action of the **pectoralis major** and the **anterior deltoids**.


sternocleido mastoid
triceps
trapezius
deltoids
biceps
biceps
pectoralis major
pronator teres
rectus abdominis
tensor fascia lata
ilio-tibial band
'Adductors'
sartorius
'Quadriceps'
vastus lateralis,
rectus femoris
and vastus medialis
in view
patella 'kneecap'
extensor digitorum longus
tibialis anterior
tibialis anterior

a Which two joints are primarily involved in these actions? Complete the table below to show which bones form each of these joints:

Joint **Elbow**

Articulating bones Humerus and Ulna

Joint **Shoulder**

Articulating bones Humerus and Scapula

continued....

Action in preparatory phase Extension

Joint **Shoulder**

Action in preparatory phase Horizontal hyperextension

c What are the main agonists causing these joint actions during the preparatory phase?

Joint **Elbow**

Agonist causing action in preparatory phase Triceps brachii

Joint **Shoulder**

Agonist causing action in preparatory phase Posterior deltoids &
latissimus dorsi

d The throwing phase involves similar movement patterns, but obviously different actions and agonists. Name them in the table below.

Joint **Elbow**

Action in throwing phase Flexion

Agonist in throwing phase Biceps brachii

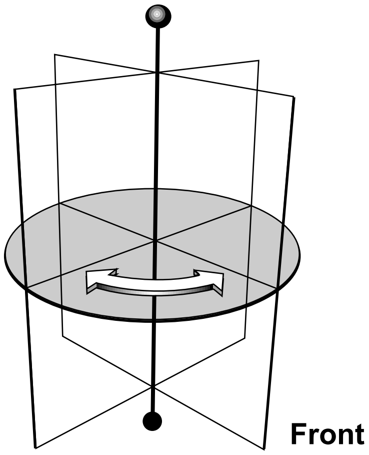
Joint **Shoulder**

Action in throwing phase Horizontal flexion

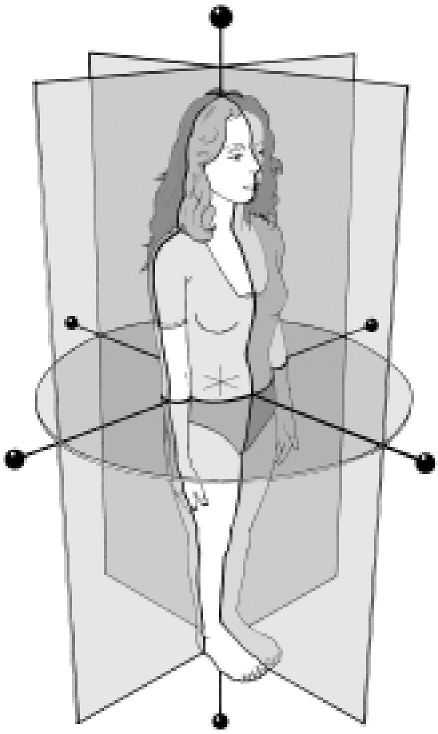
Agonist in throwing phase Anterior deltoids &
Pectoralis major

Task 6 Analysis of Racket Strokes

Answers



Vertical axis, involved in movement in a transverse plane known as **rotation**, e.g. rotating the head from side to side.



Preparatory Phase

The preparatory phase is similar to that of throwing.

Taking the arm back in preparation involves **supination** of the **forearm** and **extension** at the **elbow**. The forearm involves a **pivot** joint formed between the **radius** and **ulna**. The **elbow** is a **hinge** joint formed by the **humerus** and **ulna**. **Supination** is produced by the action of the supinator muscle. **Extension** is produced by the actions of the **triceps brachii** muscle.

At the **ball and socket** joint formed between the **humerus** and the **scapula**, there is **horizontal hyperextension** of the **shoulder** caused by the action of the **posterior deltoid** muscle, assisted by the **latissimus dorsi**.

These actions are mainly occurring in the **transverse** plane around a **longitudinal** axis.

Strike Phase

The striking phase is based on movements that occur at the **wrist**, **elbow**, **shoulder** and **trunk**.

At the **wrist** there is rotation (**pronation**) caused by the action of the **pronator teres**.

At the **elbow** there is primarily **extension**, caused by the action of the **triceps brachii**.

At the s**houlder** there is **horizontal flexion**, caused by the **pectoralis major** and the **anterior deltoid**.

In the **trunk** there is **rotation**, caused mainly by the **external oblique** muscles.

a Watch a performer in a racket game (squash, tennis or badminton), hitting the ball/shuttle – either live or using a video recording.

For ease of analysis, we are really only concerned with a forehand drive or groundstroke.

In a similar way to throwing there are two phases to striking a ball with a racket, both a preparatory phase and a striking phase.

The preparatory phase is similar to that of throwing.

In which plane does the preparation for a racket stroke, and the subsequent action, mainly occur?

Most actions are rotational - transverse plane and longitudinal axis

b The three joints concerned are the wrist, elbow and the shoulder. What are the names of the articulating bones that make up the elbow and shoulder joints?

Wrist joint

Articulating bones = Ulna and carpal bones form condyloid joint & radius& ulna form pivot joint

Elbow joint

Articulating bones = Humerus and Ulna

Shoulder joint

Articulating bones = Humerus and Scapula

c What are the main agonists and their actions at the wrist, elbow and shoulder during the preparatory phase.

Fill in the table below?

Wrist joint

Action = Supination

Agonist = Supinator

Elbow joint

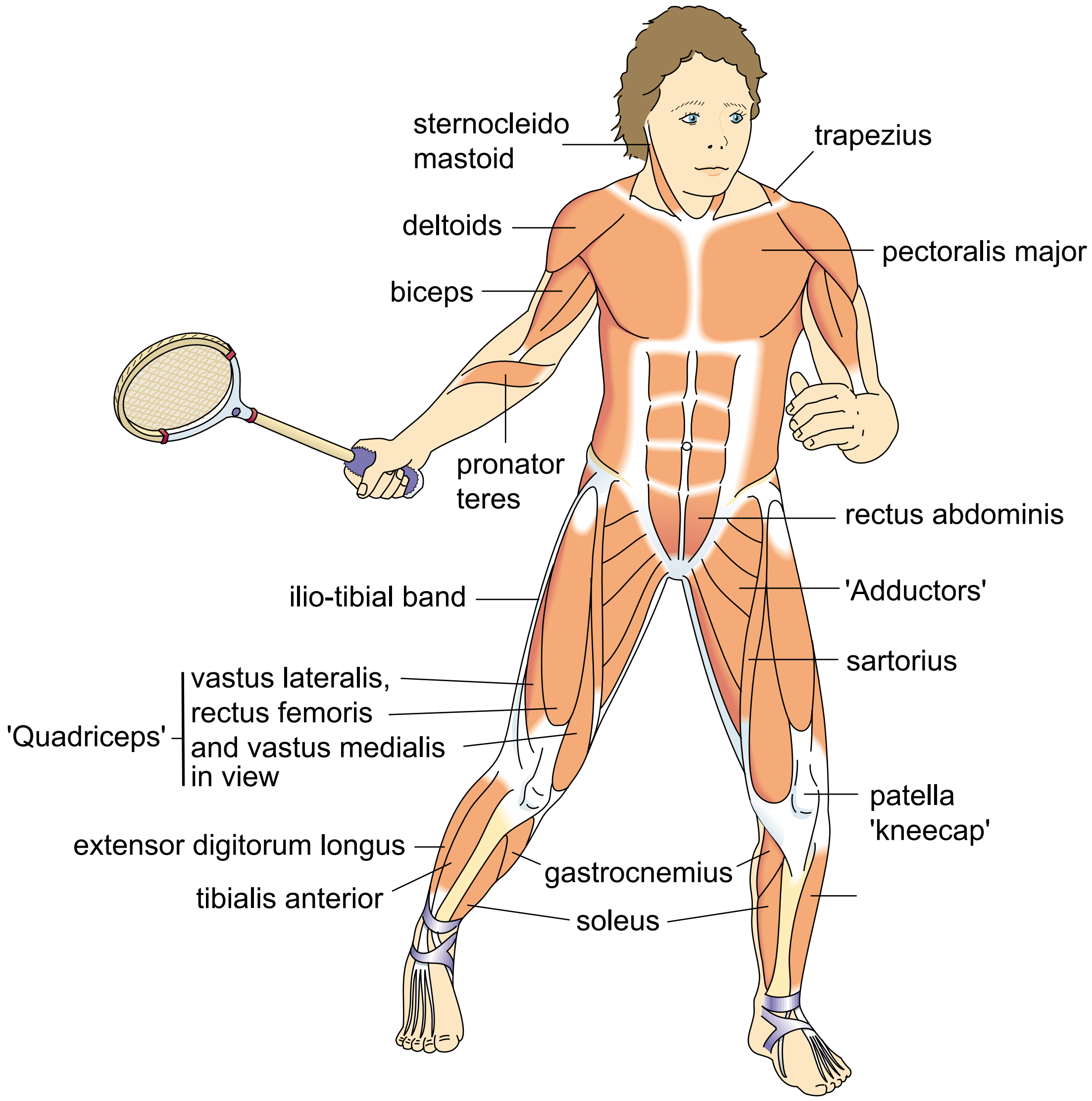
Action = Extension

Agonist = Triceps brachii

Shoulder joint

Action = Horizontal hyperextension

Agonist = Posterior deltoid and latissimus dorsi


sternocleido mastoid
trapezius
deltoids
pectoralis major
biceps
pronator teres
rectus abdominis
ilio-tibial band
'Adductors'
sartorius
'Quadriceps'
vastus lateralis,
rectus femoris
and vastus medialis
in view
patella 'kneecap'
extensor digitorum longus
gastrocnemius
tibialis anterior
soleus

d The striking phase essentially involves three joint actions.

Give the actions involved and the agonists causing the movements?

Wrist joint

Action = Pronation

Agonist = Pronator teres

Elbow joint

Action = Flexion

Agonist = Biceps brachii

Shoulder joint

Action = Horizontal flexion

Agonist = Pectoralis major & Anterior deltoid

Trunk

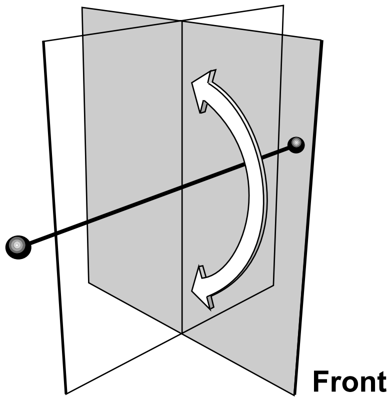
Action = Rotation

Agonist = External obliques

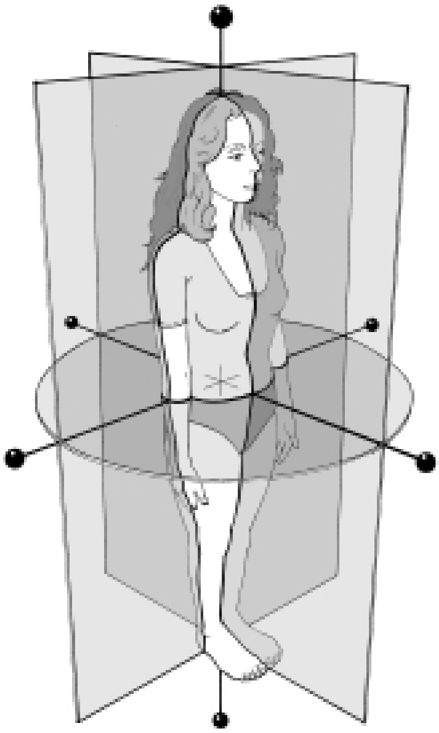
e In which plane and axis are there movements principally occurring in?

Transverse plane & longitudinal axis

Task 7 Analysis of kicking
Answers



Side to side *(transverse)* axis, involved in movement in the sagittal plane known as **flexion** and **extension**, e.g. bending *(flexion)* and straightening *(extension)* the arm at the elbow.



Watch a performer in a football-type game (rugby, soccer or Gaelic football), kicking the ball – either live or using a VCR.

We are only concerned with the leg involved with the kicking. There are two aspects to kicking a ball. There is a preparatory phase when the leg is moved prior to kicking, and there is the kicking phase during which contact is made with the ball.

There are two phases to kicking; the preparatory phase and the actual kicking phase both of which take place in a **sagittal plane** and around a **transverse axis**.

Preparatory phase

During the preparatory phase, **hyperextension** at the **hip** occurs as a result of contraction of the **gluteal** (maximus and minimus) group, and to a lesser extent, the **hamstrings** group.

At the **knee**, **flexion** is brought about by the action of the muscles of the **hamstrings** group **(biceps femoris, semimembranosus, semitendinosus)**.

At the **ankle, plantar flexion** occurs, caused principally by contraction of the **gastrocnemius**.

Kicking phase

During the kicking phase, there is **flexion** at the **hips**, due to the action of the **hip flexors**, and to a lesser extent, the **quadriceps**.

At the **knee**, there is a powerful **extension**, due to the contraction of the **quadriceps** group **(rectus femoris, vastus medialis, vastus lateralis, vastus intermedialis)**.

At the **ankle**, **plantar flexion** continues, again due to the action of the **gastrocnemius.**

a In which plane and around which axis do these actions occur?

Sagittal plane

Transverse axis

b Which three joints are involved in the kicking action?

Joint 1 Hip

Joint 2 Knee

Joint 3 Ankle

c What actions take place at each of these joints during the preparatory and kicking phases. Complete the table below.

Joint 1 Hip

Preparatory phase action = Extension & hyperextension

Kicking phase action = Flexion

Joint 2 Knee

Preparatory phase action = Flexion

Kicking phase action = Extension

Joint 3 Ankle

Preparatory phase action = Plantar flexion

Kicking phase action = Continued plantar flexion

d What are the names of the muscles that are the main agonists for each of the actions you have identified?

Complete the table overleaf.

Joint 1 Hip

Preparatory phase agonist = Gluteus maximus

Kicking phase agonist = Iliopsoas

Joint 2 Knee

Preparatory phase agonist = Hamstrings

(biceps femoris, semimembranosus, semitendinosus)

Kicking phase agonist = Quadriceps

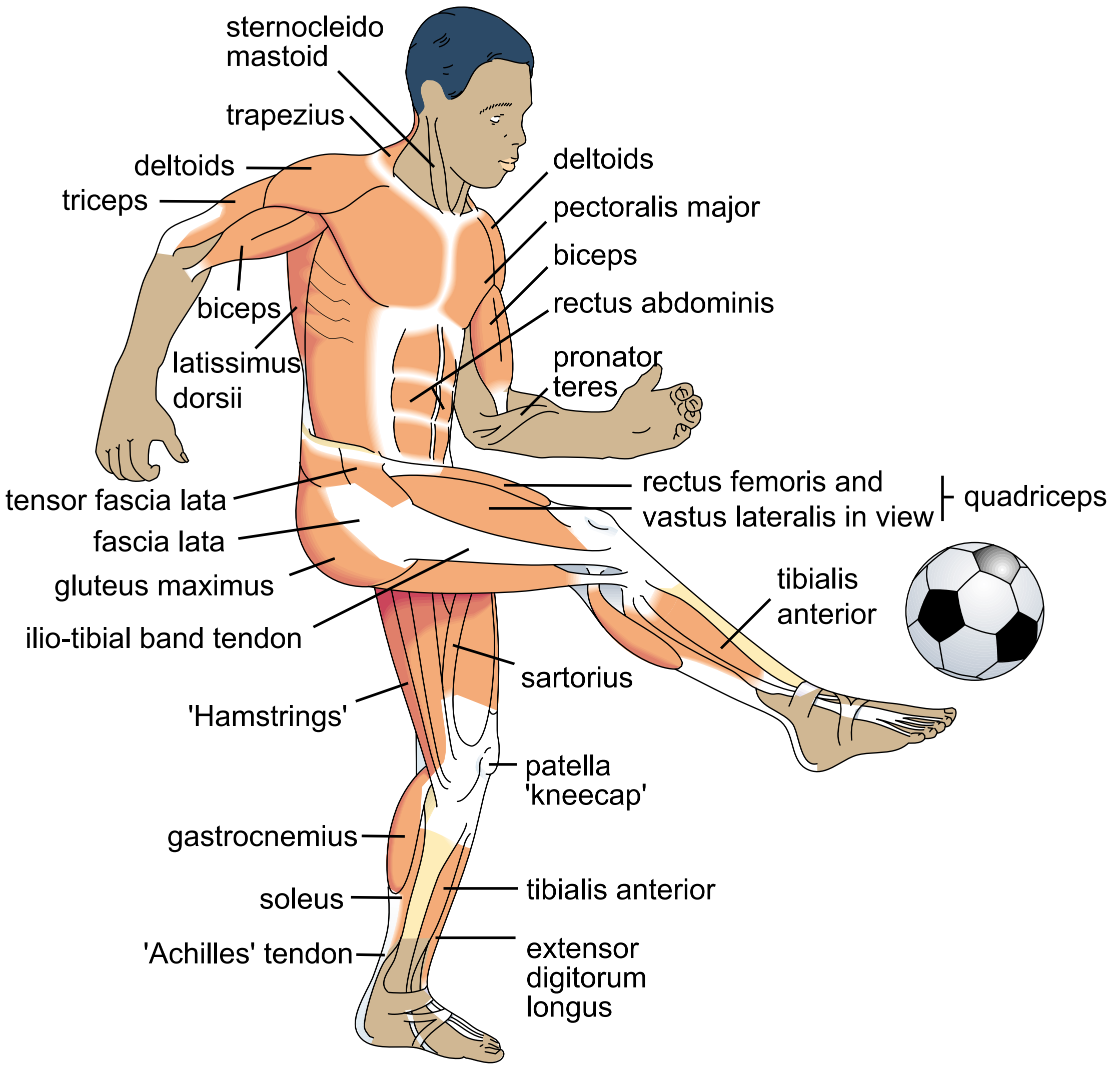
(rectus femoris, vastus medialis,

vastus lateralis, vastus intermedialis)

Joint 3 Ankle

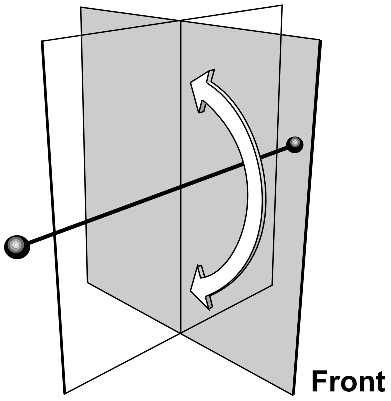
Preparatory phase agonist = Gastrocnemius

Kicking phase agonist = Gastrocnemius


sternocleido mastoid
trapezius
deltoids
triceps
biceps
latissimus dorsii
deltoids
pectoralis major
biceps
rectus abdominis
pronator teres
tensor fascia lata
fascia lata
gluteus maximus
ilio-tibial band tendon
rectus femoris and vastus lateralis in view
quadriceps
tibialis anterior
sartorius
'Hamstrings'
patella 'kneecap'
gastrocnemius
soleus
'Achilles' tendon
tibialis anterior
extensor digitorum longus

Task 8 Analysis of jumping

Answers



Side to side *(transverse)* axis, involved in movement in the sagittal plane known as **flexion** and **extension**, e.g. bending *(flexion)* and straightening *(extension)* the arm at the elbow.

Watch a performer jumping – high jump, long jump or triple jump – either live or using a VCR.

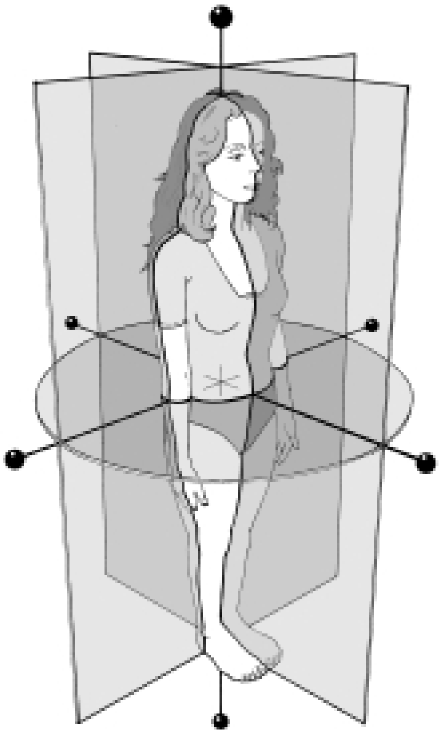
Obviously the run-up part of the event involves running. What we are concerned with now is the actual take-off phase of the jump, and we are only concerned with the leg action.

Jumping is somewhat similar to running in that the **hip, knee** and **ankle** are involved, with actions taking place in the **sagittal plane** about a **transverse axis**.

The main actions are at the **knee**, where powerful contractions of the **quadriceps group** produce **extension**.

At the **hip**, there is also **extension**, brought about mainly by the **gluteal** and **hamstrings** groups.

At the **ankle**, there is **plantar flexion**, brought about by the **gastrocnemius**.



a What plane and axis does this action take place in?

Sagittal plane & transverse axis.

b In terms of the take-off leg, muscle contractions cause movements at three different joints. Name those joints.

Joint 1 Hip
Joint 2 Knee
Joint 3 Ankle

c For each joint, complete the following table by naming the type of synovial joint located there and the type of action taking place at the joint.

Joint = Hip
Type of synovial joint = Ball & socket
Action occuring at take-off = Extension/hyperextension

Joint = Knee
Type of synovial joint = Hinge
Action occuring at take-off = Extension

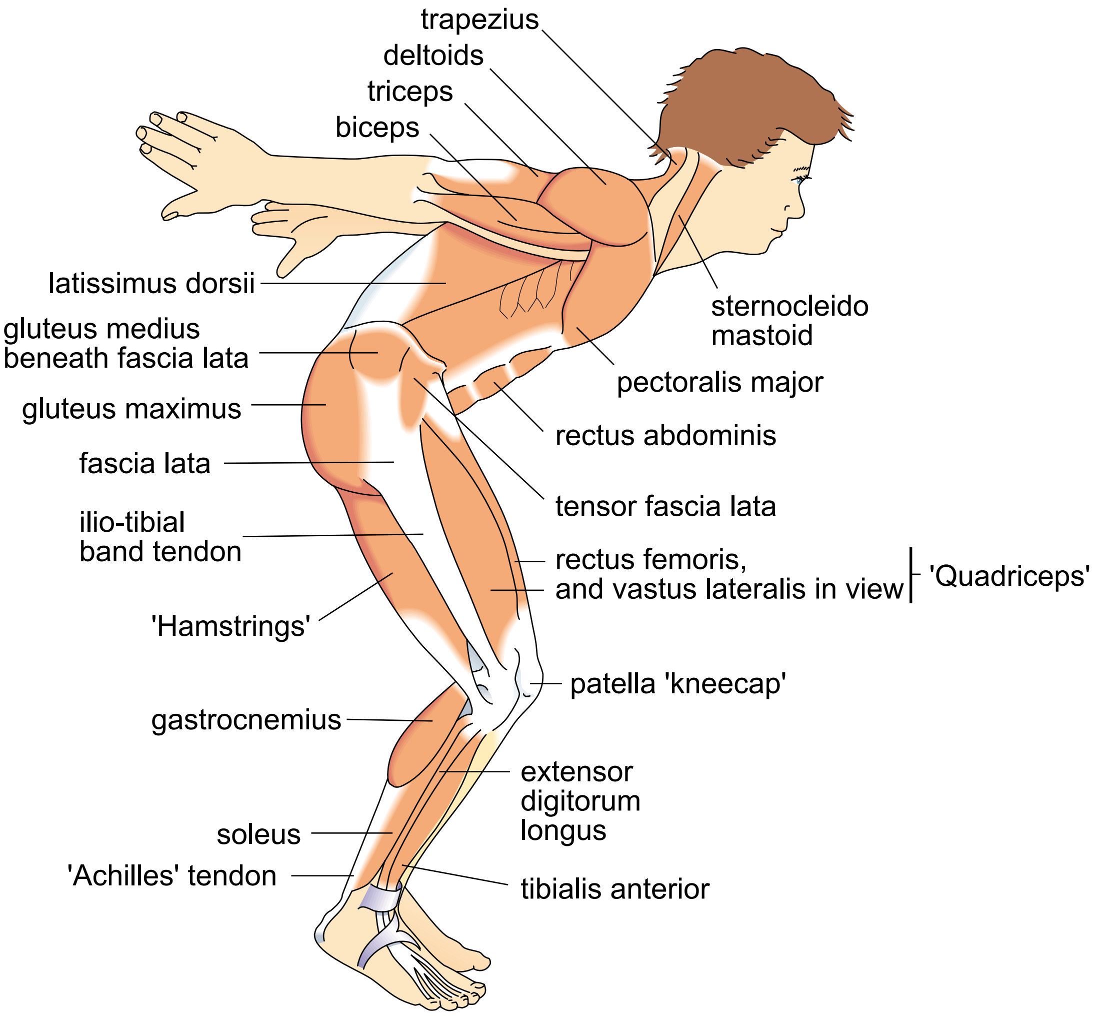
Joint = Ankle
Type of synovial joint = Hinge
Action occuring at take-off = Plantar flexion

d What are the names of the agonist muscles causing these contractions at the three joint locations?

Joint = Hip
Action occuring at take-off = Extension/hyperextension
Main agonist muscle = Gluteals/hamstrings

Joint = Knee
Action occuring at take-off = Extension
Main agonist muscle = Quadriceps

Joint = Ankle
Action occuring at take-off = Plantar flexion
Main agonist muscle = Gastrocnemius


trapezius
deltoids
triceps
biceps
latissimus dorsii
gluteus medius beneath fascia lata
gluteus maximus
fascia lata
ilio-tibial band tendon
'Hamstrings'
gastrocnemius
soleus
'Achilles' tendon
sternocleido mastoid
pectoralis major
rectus abdominis
tensor fascia lata
rectus femoris, and vastus lateralis in view
'Quadriceps'
patella 'kneecap'
extensor digitorum longus
tibialis anterior

Task 9 Levers
Answers

Work through the following, answering the questions in the spaces provided.

A lever is a "bar or some other rigid structure, hinged at one point, and to which forces are applied at two other points".

In simple terms, levers are sometimes best considered as a plank of wood that you might use for moving things (levering!).

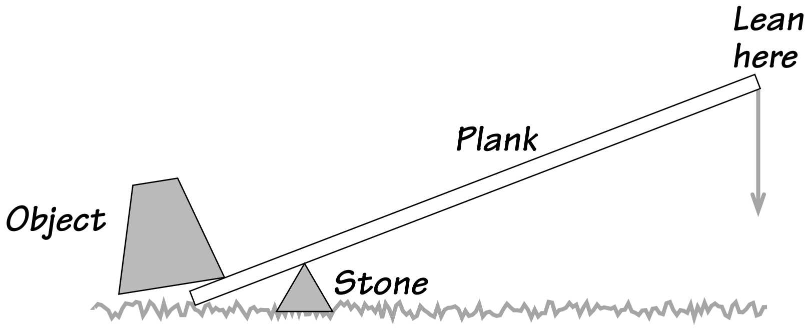
As such, it is a simple machine, having only four parts:

- The plank of wood, called the bar or lever;
- A pivot point more properly called a fulcrum;
- A weight to be moved, called a resistance;
- An applied force (applied by you!) called the effort.

Depending on the relative position of the three components (fulcrum, resistance and effort), that are acting on the plank, there are three orders or classes of levers.

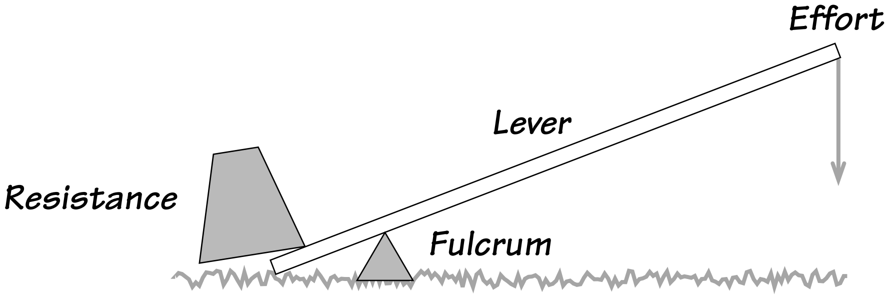
a Imagine using a plank of wood to lever up a heavy object. To help you move the object, you might place the plank under the object, place a rock under the plank, and lean on the other end of the plank in order to move the object.

Draw a diagram of this arrangement in the space below, labelling the object, the rock, the plank, and the place where you would lean to apply the most force and get the easiest movement:



Providing your diagram is correct, you have in fact drawn a lever system - the plank is the lever, the object is the resistance, the rock is the fulcrum, and the place where you lean is where you apply the effort.

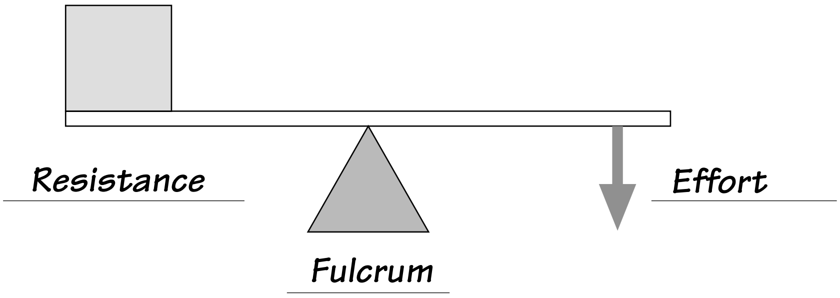
b Re-draw your diagram in the space below, but this time use the correct labels - lever; fulcrum; resistance and effort.



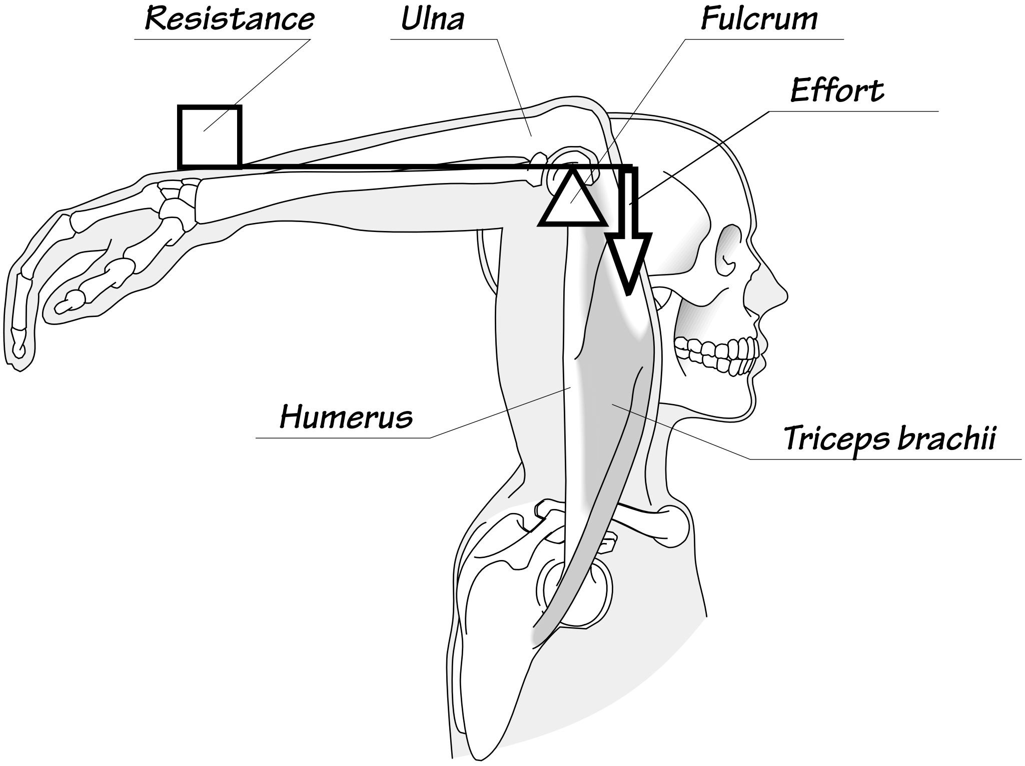
This type of lever, where the fulcrum lies between the effort and the resistance is called a **First Class Lever**. Other examples of first class lever systems would include a crowbar, a seesaw, and scissors.

In the human body, this type of lever system is found at the elbow, where the triceps brachii muscle acts to provide the effort, the joint itself is the fulcrum, the bones of the forearm are the lever and the weight of the arm and whatever is in the hand, is the resistance.

c Label the effort, fulcrum and resistance in the two diagrams of a first class lever, shown below:


Resistance
Effort
Fulcrum

The first class lever at the elbow joint – you could also label the bones and muscles involved:

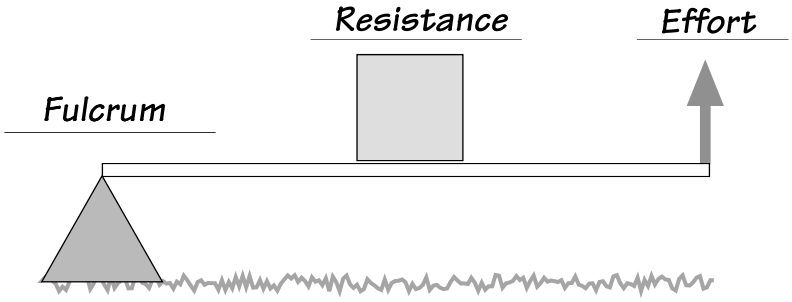

Resistance
Ulna
Fulcrum
Effort
Humerus
Triceps brachii

Note that it is usual for the fulcrum to be drawn as a triangle, the resistance as a square, and the effort as an arrow.

d Now consider a different arrangement. This time you have a heavy object on your plank, acting as a resistance, and you are trying to move it to a higher position.

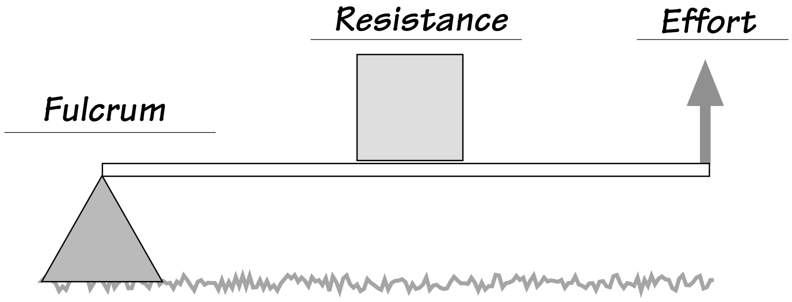
You place a rock under one end of the plank to act as a pivot, and you move the object by lifting (effort) the other end of the plank.

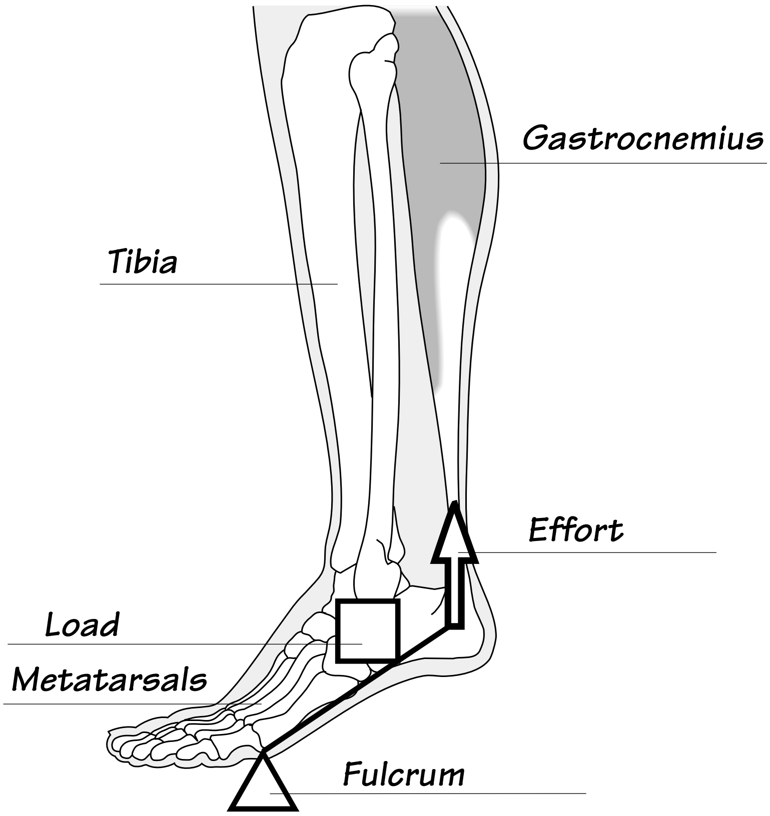
Draw a labelled diagram, in the space below, of this arrangement of lever, fulcrum, resistance and effort:



What you have drawn is an example of a **Second Class lever**. The resistance is in the middle of the other two components. Other examples would be a wheelbarrow, or a door opening on its hinges.

e Label these components on the diagrams below:

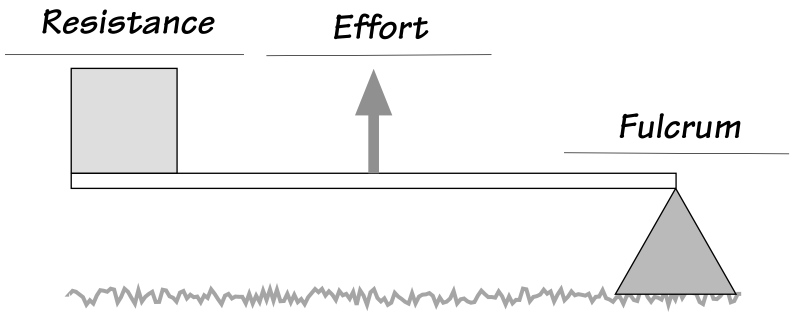



Gastrocnemius
Tibia
Effort
Load
Metatarsals
Fulcrum

In the body, this type of lever system is found in the foot, where the bones of the foot act as the lever, the joint at the ball of the foot acts as the fulcrum, the gastrocnemius muscle provides the effort, and the weight of the body, acting through the bones of the lower leg, provides the resistance.

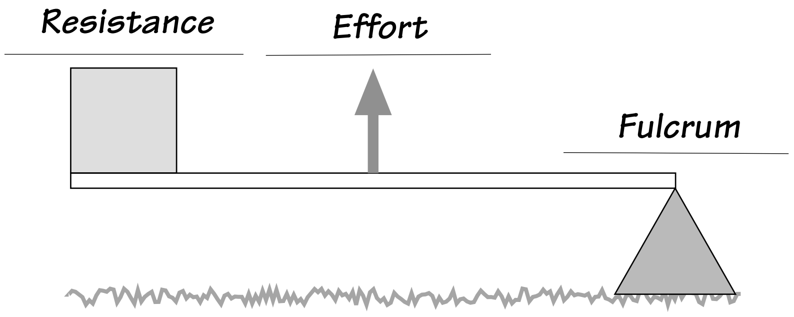
Label these components on the diagram below a second class lever at the joint in the ball of the foot – again add the correct anatomical terms

f **In Third Class Levers**, the effort is between the fulcrum and the resistance. Try drawing a simple diagram of this arrangement in the space below:

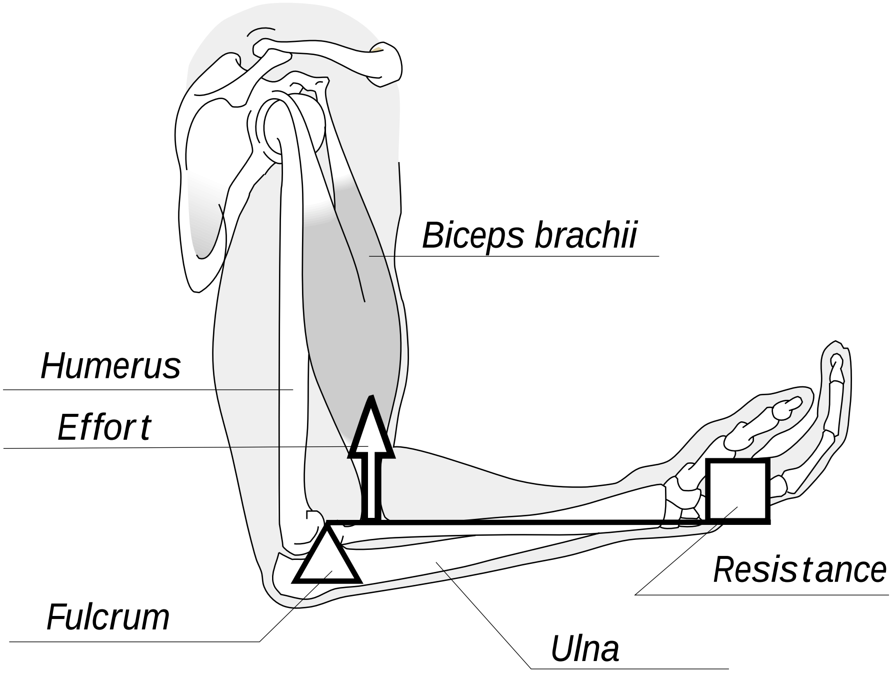

Resistance
Effort
Fulcrum

g In the body, the way the biceps brachii muscle acts on the elbow joint is an example of a third class lever.

Label the fulcrum, effort and resistance on the following diagrams:


Resistance
Effort
Fulcrum

The third class lever found at the elbow joint – also label the muscles and bones indicated.


Biceps brachii
Humerus
Effort
Resistance
Fulcrum
Ulna

It might help you remember the three classes of levers and the corresponding positions of their components if you remember that in levers, the middle component follows the mnemonic;

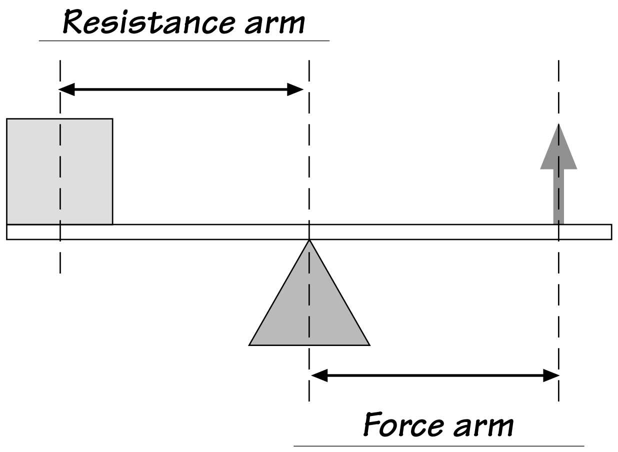
1, 2, 3 – F, R, E

In other words, in a first class lever, the Fulcrum **F** is in the middle. Second class lever – Resistance **R** is in the middle, and third class Effort **E** is in the middle.

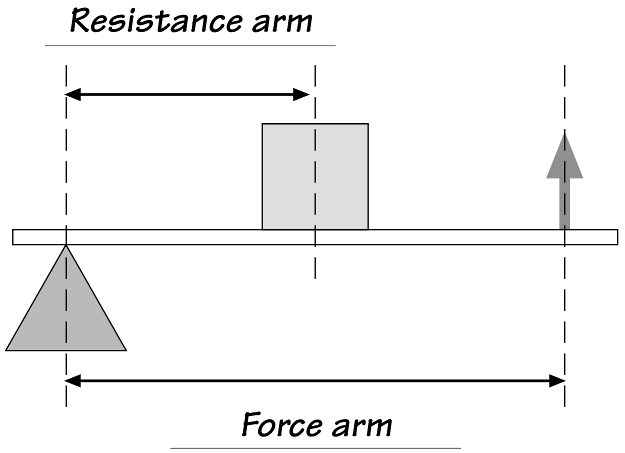
In all classes of lever, there are two other parts of the lever to consider.

h The force arm is the name given to the shortest perpendicular distance between the fulcrum and the point of application of the effort; whilst the resistance arm is the name of the shortest perpendicular distance between the fulcrum and the resistance.

Label the force arm and the resistance arm on this diagram of a first class lever:

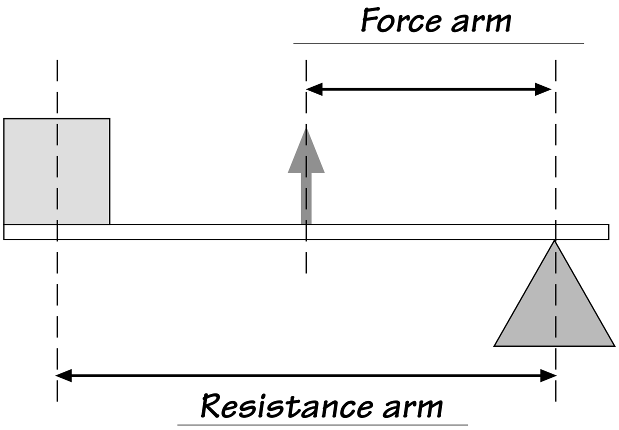


i Draw a simple diagram of a second class lever in the space below, and label the force arm and the resistance arm:



Can you see that the force arm is longer than the resistance arm? When this is the case, only a relatively small force is required to cause the lever to work. For this reason, second class levers are especially good at moving heavy resistances.

j Draw a simple diagram of a third class lever in the space below, and label the force arm and the resistance arm:



Can you see that in this type of lever, the resistance arm is always longer than the force arm? When this is the case, a small amount of movement where the force is applied produces a large movement at the resistance end.

Levers have two main functions:

1 **To increase the amount of resistance that can be moved by a given force**.

To do this, the force arm must be longer than the resistance arm, as is always found in second class levers.

2 **To increase the speed and range over which the lever can move the resistance**. This can only happen if the resistance arm is longer than the force arm. When this is the case, small movements where the force is applied produces rapid movements over long distances at the resistance end.

The vast majority of levers in your body are **third class levers**, and are better suited to rapid movements over a large range of movement, because of the length of the resistance arm (the distance from the joint to the end of the bones forming the lever), is small as compared to the length of the force arm (the distance from the joint to the muscle attachment).

Hence, we get a large range of movement at the resistance end of our levers, for only a short amount of movement at the force end. However, because the force arm is so short in our lever systems, we are unable to move as much resistance as other lever systems would provide.

Hence we gain a wide range of movement from our levers, at the expense of being only able to move limited resistances. This is known as our **mechanical disadvantage**.

Part 7 Teaching Resource

‘Solo Rock Climbers– Fools, Heroes or Gymnasts?’

General Considerations and Objectives

Students have often experienced outdoor adventure type activities and have some knowledge of the types of activities involved. They have less knowledge of the wide variety of reasons why individual may choose these activities or that similar experiences may be gained regardless of the level of skill involved.

In relation to risk students also need to understand risk that is objective – derived form the environment regardless of the knowledge skills or experience of participants and subjective risk which is related to an individual's knowledge or experience. This is particularly relevant when utilising adventure activities in an educational setting.

On completing this unit students should be able to understand and apply the following theoretical concepts to appropriate physical activities.

1. The characteristics and values associated with outdoor education, recreation and adventure.
2. The educational and recreational values that may found developed when engaging in physical activity within the natural environment.
3. The nature of risk, safety, challenge and adventure.

Teaching Strategy

Personal experience is an invaluable support to student learning in this aspect of the specification. In an ideal situation an outdoor activities trip would be the best way to experience the range of activities, which fall under the umbrella heading of outdoor activities and adventure. This is clearly not a possibility for many centres and teachers could look for alternatives within the urban environment such as climbing walls, us of lakes for canoeing/sailing, orienteering courses in parks. Failing that some form of trust games or teamwork exercises can reproduce some of the factors and characteristics of outdoor activities and adventure.

Trust Game

a Split down into groups of three or four. One person needs to volunteer to be led over the course blindfolded, helped by the others in the group.

KEEP THE BOXES AND BENCHES FAIRLY LOW TO MINIMISE THE RISK OF INJURY. PLACE MATS IN APPROPRIATE POSITIONS TO ADD EXTRA PROTECTION

b All except the blindfolded volunteer set out an obstacle course using boxes, frames, benches, mats etc.

c Get a second volunteer and blindfold them. Reorder the course and then guide the volunteer around the objects by listening to shouted directions.

d Blindfold the whole group. Rearrange the obstacles again and then get the whole group to go around the obstacles whilst remaining together. Wrists can be tied together to keep everyone together.

Adventure Activity Questionnaire

1 Did you experience any feelings of concern, worry or anxiety whilst undertaking the activity? Can you describe those feelings?

2 On a scale of 1 to 4 indicate at which the level of anxiety you might have felt

Individual activity		Group Activity
4	Very worried/frightened	4
3	Worried but not frightened	3
2	Generally calm most of the time	2
1	Completely unworried	1

3 On a scale of 1 to 4 rate the level of enjoyment you experienced

Individual activity		Group Activity
1	Boring	1
2	Mildly amusing	2
3	Good fun – would do it again	3
4	Brilliant activity	4

4 On a scale of 1 to 4 rate the level of danger to which you think consider you were exposed.

Individual activity		Group Activity
1	None	1
2	Mildly dangerous	2
3	Pretty dangerous	3
4	Very dangerous	4

5 What elements of the activity made it feel safer or less dangerous?

Part 8 Teaching Resource

‘Exercise Physiology Exercise and the Heart’

General Considerations & Objectives

1. To permit students to acquire knowledge of cardiac physiology during rest and exercise.
2. To allow students to understand the link between physiology and performance.
3. To enable students to be able to apply this acquired knowledge to the development of their Personal Exercise Plan

Tasks

In this study pack you will find a range of tasks requiring the students to analyse a variety of physiological phenomena. They will need to:

- Identify the structures involved
- Determine the functions of the various components
- Understand the link between physiological effects and performance.

All the tasks require them to work either from the tasks as free-standing units, or to use the tasks as additional reinforcement to class-delivered lessons.

The student's work could simply be assessed as answers to questions, or it may be assessed as part of a groups work, or through class discussion.

The physiology of exercise may form a relevant component to the background research of their Personal Exercise Plan.

Be prepared to answer questions and to make suggestions.

A list is provided of a number of suitable textbooks. Your centre may also have suitable posters, videos that will help. Always remember that the teacher is ultimately the best resource. Independent learning does not mean don't ask me!

C3.1b Make a presentation about a complex subject, using at least one image to illustrate complex points. (Students could give a presentation showing how heart rate is regulated, this could also link to IT Key Skills – see below)

Information Technology Plan and carry through at least one substantial activity that includes tasks for IT3.1, IT3.2 and IT3.3 (Prepare a plan of how they are going to find the information, use it, adapt it to provide more information and then present it)

IT3.1 Plan, and use different sources to search for, and select, information required for two different purposes. (Gather information from the Internet and from CD ROMs – these could be text, images, animations etc)

IT3.2 Explore, develop, and exchange information and derive new information to meet two different purposes. (Adapt the information, combine images and text together, use a flow chart etc to prepare a presentation on regulation of heart rate)

IT3.3 Present information from different sources for one purpose and audience. (Using either Microsoft Publisher or PowerPoint, prepare a presentation with supporting notes – this could be for their peers or perhaps as a revision exercise for GCSE or Year 13 A Level students)

Task 1 Analysis of the effects of exercise

a Through participation or through observation of a participant, make a list in the space provided below, of the changes that occur to the body during the exercise. NB you are **NOT** looking for long-term training effects, just the immediate effects of exercise.

i Increased heart rate

ii Increased breathing rate

iii Increased depth of breathing

iv Sweating

v Redening of skin

vi Localised fatigue

b For each of the changes that you have listed, complete the table to suggest why they have occurred.

	Change	Reason
i	Increased heart rate	Heart beats faster to pump more oxygenated blood to working muscles so that they can use more energy.
ii	Increased breathing rate	Breathing faster takes in more air containing oxygen, so that more oxygen can be provided to working muscles, and more carbon dioxide removed.
iii	Increased depth of breathing	Breathing deeper takes in more air containing oxygen so that more oxygen can be provided to working muscles, and more carbon dioxide removed.
iv	Sweating	Energy use generates heat - excess heat is lost by sweating which cools the skin and therefore the body.
v	Reddening of skin	Energy use generates heat, more blood enters skin blood vessels, therefore more heat can be lost by radiation.
vi	Localised fatigue	Rapid energy use generates lactic acid through anaerobic systems, which leads to fatigue.

Task 2 Developing a Performance Model

a Record the results of the whole group for a fitness test based on stamina. List the results in rank order, starting with the best result at the top.

b Repeat the same procedure for a different test for stamina that uses a completely different method of locomotion (movement) and compare the ranked results.

For example, compare the results of the class for a step test with those obtained by the same class for a cycle ergometer test; or compare the results of a multistage shuttle run test with the results of a cycle ergometer test.

c Are the two sets of results that you compare exactly the same? They're almost certainly not!

Can you suggest possible reasons why one person can do better than another in any **one** test?

Differences in:
fitness/ability/technique/skill/physique/
injury/environmental conditions

continued....

d Can you suggest reasons for the differences between the same individual's performance in **different** tests?

Make your own list of possible reasons: (the following are merely suggestions)

i Technique

/skill/practice

ii Fitness levels

/fatigue/stamina/endurance levels specific to activity

iii Physique

/muscle composition

iv Energy systems

anaerobic/aerobic

v Heart

/blood/oxygen/lung systems

continued....

e Now work with others in small groups and see what common factors you have listed.

i Skill related

ii Fitness/fatigue related

iii cardio-vascular related

f Try to explain the differences you have found in terms of , breathing/heart rate/blood transport, fatigue/fitness and skill.

One major factor is concerned with breathing and heart rate and blood transport to muscles. All of these are linked to oxygen delivery. We need oxygen for our muscles to contract. Oxygen comes from the air we breathe in, and it is transported to the muscles by the blood. When we exercise we breathe faster to deliver more oxygen to the blood, and at the same time our heart pumps the blood around the body at a faster rate, so the muscles receive sufficient oxygen for them to contract. We can only deliver a certain amount of oxygen, and our muscles can only use a certain amount of oxygen. We call this delivery and upper limit of oxygen consumption called our maximum use of oxygen our oxygen consumption. Each of us has our own oxygen consumption or VO_2 max. Insufficient delivery of oxygen to the working muscles will eventually result in the second factor.

A second major factor is concerned with fatigue. As we exercise our muscles may tire. If large muscles such as those in the legs are involved, or if we work very hard on small muscles then we may become too exhausted to carry on. You may have talked about fitness being important. Our ability to continue exercising without fatigue is an important aspect of fitness. The fatigue we feel is due to the build up (accumulation) of a chemical (lactic acid) as a result of anaerobic respiration. The point at which this lactate begins to build up in your blood is called the lactate threshold. The fitter you are, the harder you can exercise before reaching this threshold.

Thirdly you may have talked about the type of exercise involved, or suggested that some people are simply better at running/stepping/cycling than others. Here we are talking about technique or skill. As you become more skilled at an activity you stop wasting energy on unwanted movements. Movement involves muscles contracting and bones acting as levers, an aspect of P.E. called mechanics. In other words you become mechanically efficient. Skilled performers look good and appear able to perform their skills without any unnecessary haste, in fact they will often look almost casual whilst doing the hardest movements

Note that any other factors that you or you group have suggested will in some way fit into the three factors hinted at above.

Task 3 Heart rate and Workload

In an experiment, a subject pedalled an ergometer (a specialised exercise bike) for three minutes at a workload that was previously determined by their age and condition, and at the end of this time, their heart rate was measured using a pulseometer.

An ergometer consists of a stationary bike, where the pedals drive a flywheel that is affected by a belt that surrounds the flywheel. If the belt is tightened, the friction of the belt on the flywheel makes it harder to pedal. The amount of friction applied is carefully measured and thus the workload may be adjusted and measured.

The workload is kept constant by making the subject pedal at a constant rate as shown by a dial that indicates revolutions per minute. Thus, if the subject cycling at 50 r.p.m. with the friction belt set at a known tension, the subject is exercising at a known workload measured in Watts.

The workload was then increased, by tightening the friction belt, to a suitable higher intensity, and the subject continued pedalling for a further 3 minutes, at the end of which time, the heart rate was measured again.

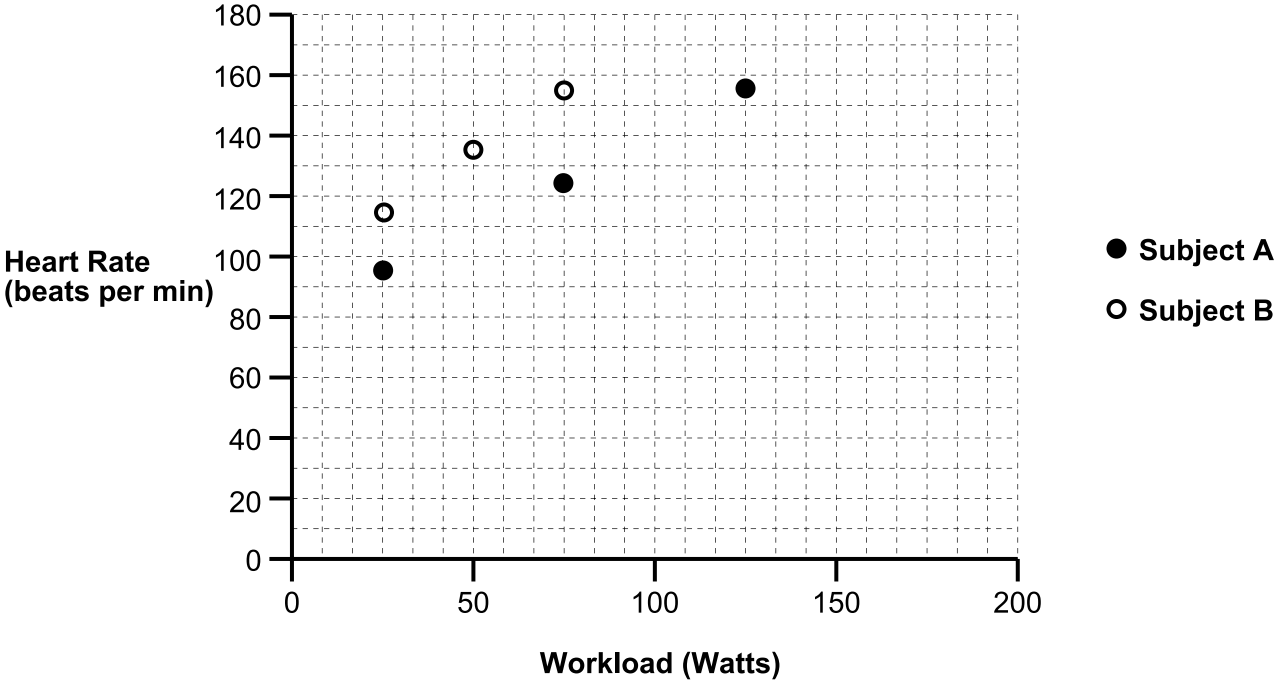
A further increase in workload was given, three minutes of pedalling allowed, and a final heart rate measured.

The following results were obtained:

Watts	25	50	75	100	125
Subject A	96		125		156
Subject B	115	135	155		

continued....

a Plot these results as a fully labelled graph. – see answers



b What do the results tell you?

The three heart rates, when plotted graphically against the corresponding workloads, produce a straight-line relationship.

In other words heart rate increase is directly proportionaly to workload.

c Suggest why heart rate should increase as workload increases?

To cope with demand for oxygen that is needed for energy release.

d Work out what heart rate would have occurred if subject B had attempted to cycle at 100 Watts. (Hint – extend the plot line on the graph)

175 bts/min

e What would have been the heart rate of subject A if they had exercised at 175 Watts?

186 bts/min

f How many times per second does subjects A's heart beat when exercising at 175 Watts?

approx 3 bts per second (186 ÷ 60)

g According to the figures provided what is the projected heart rate of subject B at 200 Watts?

255 bts/min

h What is the problem with projected heart rates?

There is an upper limit to how fast the heart can beat. It is normally assumed that our maximum heart rate is 220 bts/min minus your age.

Task 4 Control of Heart Rate

a When we exercise our heart rate increases to supply blood and hence oxygen to our muscles.

i What causes this increase in heart rate?

Usual answer is an increase in oxygen demand

ii What is the oxygen used for in the muscle?

Oxidation of energy rich materials eg glucose

b Read the following and answer the questions that follow.

The regulation of heart rate is brought about by the body detecting the need for any increase in heart rate by sensing an increase in blood **acidity** (lower blood pH).

Increases in blood acidity are mainly due to increasing amounts of **carbon dioxide** being produced during exercise.

Carbon dioxide is produced as a waste product by exercising muscles.

The carbon dioxide produced dissolves in the blood, producing a weak acid, **carbonic acid**. Thus exercise increases the acidity of the blood.

Increasing levels of acidity in the blood are detected by **chemoreceptors**, and this results in an increase in heart rate.

There are chemoreceptors in the medulla of the brain, and in the carotid bodies within the neck that detect increasing blood acidity, and send impulses to the cardiac centre in the medulla. In turn, the cardiac centre sends less impulses along the **vagus** nerve and more along the **sympathetic** nerve to the heart which increases the heart rate.

During exercise, the heart rate can almost triple from its resting rate, and exercising heart rates of over 160 beats per minute are by no means unusual.

i What is the name of the structures that detect changes in blood acidity?

Chemoreceptors

ii Where is the control centre for heart rate?

Medulla of brain

iii What causes the increase in acidity that occurs during exercise?

Carbon dioxide/lactic acid

iv What is the name of a nerve that takes impulses to the heart?

Vagus nerve

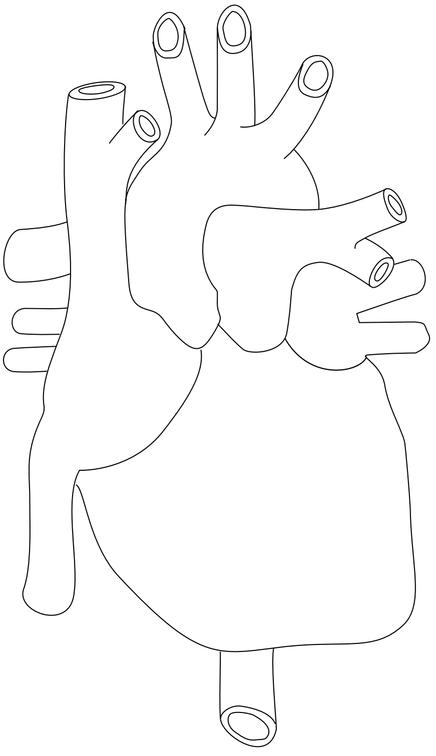
v Photocopy the diagrams, arrows and labels found on the next page and cut them out and construct a flow chart that summarises the control of the increase in heart rate.

Detected by

Increase in heart rate

Sympathetic nerve impulses

Nerve impulses to brain

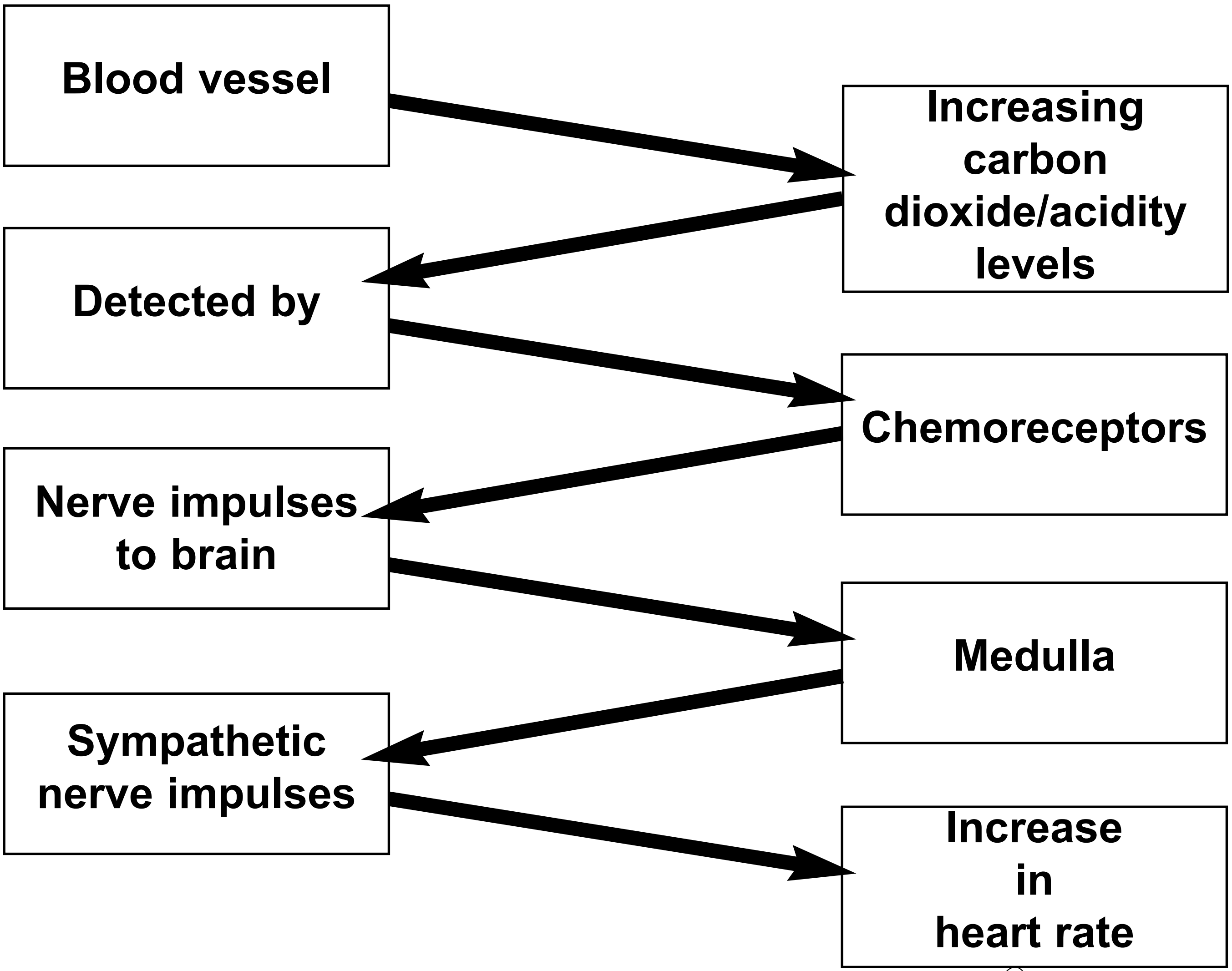


Blood vessel

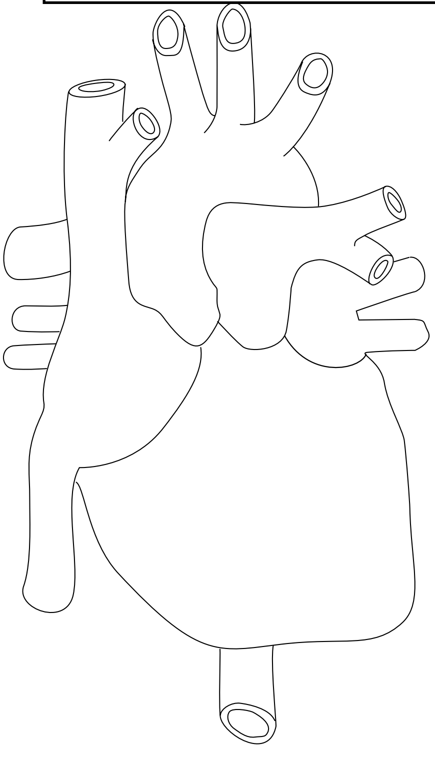
Medulla

Increasing carbon dioxide/acidity levels

Chemoreceptors


Blood vessel
Increasing carbon dioxide/acidity levels
Detected by
Chemoreceptors
Nerve impulses to brain
Medulla
Sympathetic nerve impulses
Increase in heart rate

Correct flowchart



Task 5 Cardiac cycle

a The following passage describes the cardiac cycle and its regulation.

Several words have been deliberately omitted. You should first read a textbook about the cardiac cycle, and then read through the passage and fill in the missing words, as well as making a list of the missing words.

Normally the two atria contract simultaneously whilst the two ventricles are relaxed, then, when the two ventricles contract, the atria are relaxed.

The period of a contraction is called

systole

The period of relaxation is called

diastole

The cardiac cycle therefore consists of an atrial

systole

followed by a ventricular

systole

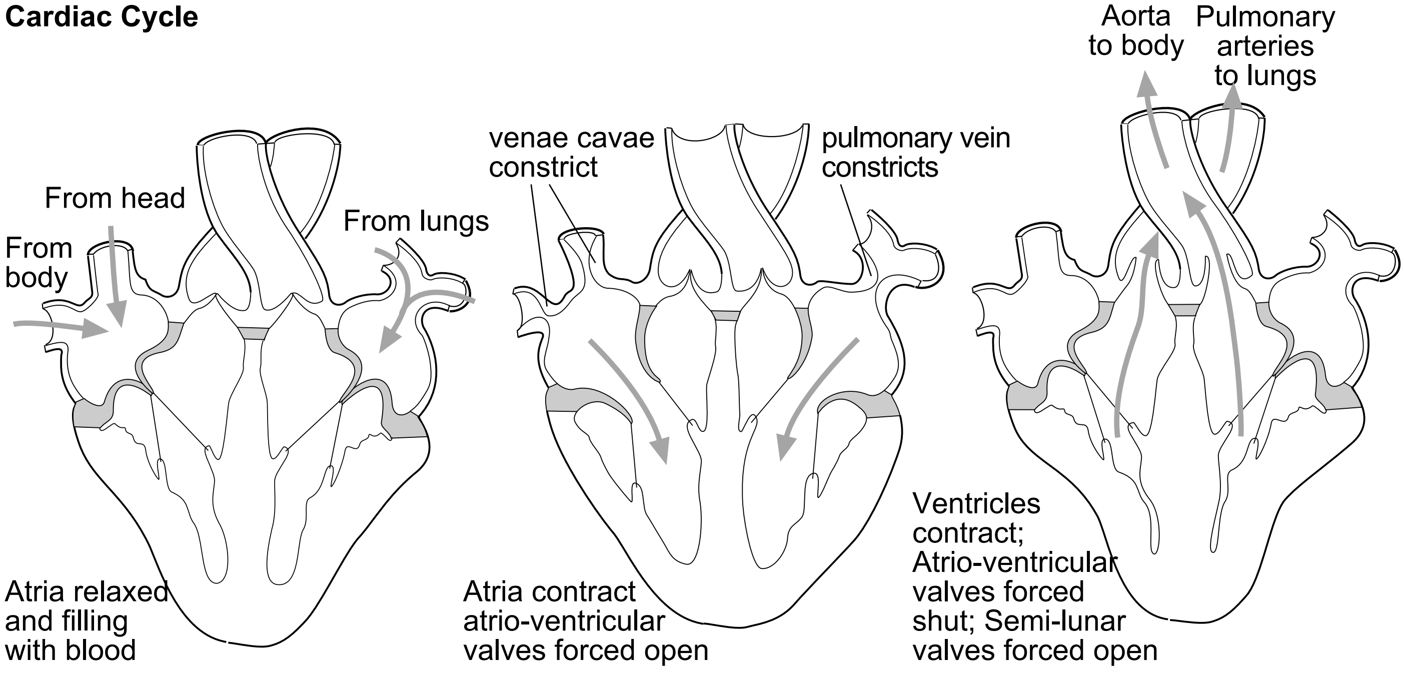
followed by a

diastole

of the whole of the heart.

These stages are shown in the diagram.

Cardiac Cycle


From head
From body
From lungs
Atria relaxed and filling with blood
venae cavae constrict
pulmonary vein constricts
Atria contract atrio-ventricular valves forced open
Aorta to body
Pulmonary arteries to lungs
Ventricles contract; Atrio-ventricular valves forced shut; Semi-lunar valves forced open

The cardiac cycle is triggered by an electrical stimulus called the cardiac impulse. This originates in a small mass of tissue located in a region of the right atrium, called the

sino-atrial node (SAN)

or pacemaker.

The electrical stimulus generated by the

SAN

spreads out into the walls of the atria causing their contraction, in others words atrial

systole

A ring of fibrous tissue separates the atria from the ventricles, and prevents the impulse passing straight on to the ventricles. Instead, a second node, called the

atrio-ventricular node (AVN)

which is also found in the right atrium, picks up the impulse.

From here, it is conducted through the fibrous ring, along a short bundle of specialised conducting fibres called the

Bundle of His

The bundle divides within the septum that separates the two ventricles, into left and right branches, which conduct the impulse to the apex (tip) of the heart, where the branches turn up along the ventricular myocardium through a finely branching network of

Purkinje fibres

Impulses from these cause the walls of the ventricles to contract.

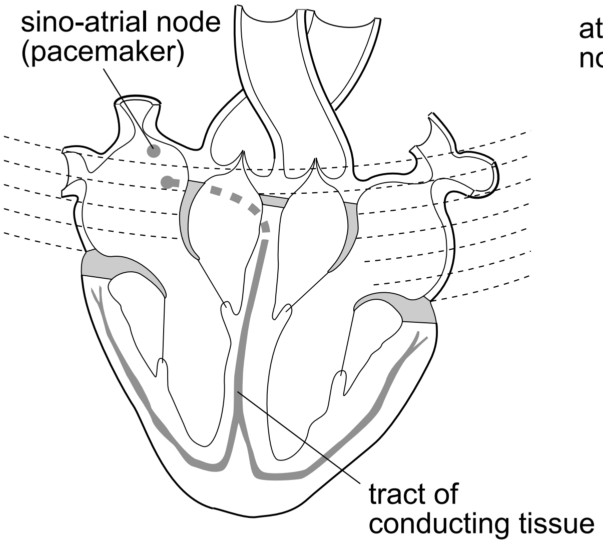
The contraction of the heart muscle is thus controlled by the heart's own conduction system.

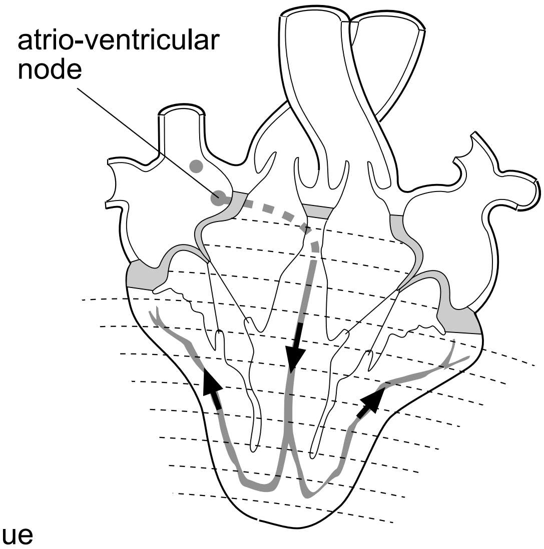
The diagram shows the cardiac cycle, with the electrical impulses passing through the atria, followed by atrial

systole

and then the conduction of impulses down to the apex of the ventricle, and subsequent ventricular

systole





The

SAN

initiates atrial

systole

and this is followed a fraction later by ventricular

systole

which because of the nature of the conduction system begins at the apex (tip) of the ventricles. Once

systole

has finished,

diastole

follows.

The movement of blood through the heart is directed by the heart valves, the opening and closing of which is in turn controlled by the changes in blood pressure that occur within the chambers of the heart.

Blood flows from an area of high pressure to an area of lower pressure.

The pressure in the atria and ventricles are called the **atrial** and **ventricular pressures** respectively, whilst the pressure in both the aorta and pulmonary arteries is called the **arterial pressure**.

Normally, blood flows continuously from the inferior and superior vena cavae into the right atrium, and from the pulmonary veins into the left atrium.

The majority of this blood, then flows passively into the ventricles, before atrial

systole

begins. The atrio-ventricular valves are both open as this is happening. When the

SAN

fires, the atria contract, forcing the blood remaining within them into the ventricles. Soon after the ventricles have filled, the

AVN

fires, and the ventricles begin to contract. The force of the contraction increases the pressure of the blood within the ventricles, and this eventually exceeds the pressure within the atria. This causes the atrio-ventricular valves to

close

At this time, the ventricles are contracting, but the ventricles are not emptying.

As this ventricular pressure rises, it eventually becomes greater than the arterial pressure in the aorta and pulmonary trunk. This forces the semi-lunar valves to

open

and blood is then expelled from the heart into the pulmonary and aortic trunks.

At the end of ventricular contraction, the ventricles suddenly begin to relax

diastole

The pressure within the ventricles falls below that of the arterial pressure. The higher pressure in the arteries causes the semi-lunar valves to

close

The ventricular pressure then falls below that of the atria, and the higher pressure within the atria causes the atrio-ventricular valves to

open

The beat of the heart is under both nervous and hormonal control. If left to its own devices, the human heart beats at approximately 120 beats per minute. Under normal circumstances, our heart rate is less than this (average = 70 beats per min), and so a ‘breaking system’ is employed.

Nerve impulses from a cardiac centre in the

medulla

region of the brain, travel along the parasympathetic,

vagus

nerve, and these cause the

SAN

to slow down.

The more impulses that reach the

SAN

via the parasympathetic

vagus

nerve, the greater the effect of this breaking system. Thus, by controlling the amount of impulses passing along the

vagus

nerve, the brain can control the heart rate.

Similarly, when necessary the heart rate can be increased to above 120 beats per minute by reducing the rate of firing of the vagus nerve, and at the same time, sending more impulses from the cardiac centre, along the sympathetic

cardiac

nerve, which will speed up the

SAN

These two nerve supplies act as a break and accelerator by releasing neurotransmitters onto the

SAN

The sympathetic neurotransmitter is called

noradrenaline

and the parasympathetic neurotransmitter is called

acetylcholine

During times of stress, parasympathetic impulses decrease, sympathetic impulses increase, and the hormone

adrenaline

is released from the medulla of the adrenal glands into the blood. These changes increase the amount of blood expelled during each contraction (stroke volume) of the heart, and the rate of the heart beat.

This stress reaction invariably occurs when you anticipate and/or prepare for exercise.

b Explain in your own words why the ventricles contract some time after the atria.

The electrical impulses from the SAN that cause contraction of the atria are picked up by the AVN and transmitted through a gap in the fibrous ring between the atria and the ventricles. These impulses initially travel down to the base of the inter-ventricular septum (bundle of His) before causing contraction of the ventricles. This explains the delay.

c Why does the initial contraction of the ventricles begin at their apex?

Following on from the answer to question 1, the initial contractions of the ventricles begin at the end of the bundle of His, which is at the apex (tip) of the ventricles before spreading out through the rest of the ventricular myocardium

d Produce a table that lists the sequence of opening and closing of the atrio-ventricular and semi-lunar valves, beginning with the atrio-ventricular valves being open.

	A-V valves	**S-L valves**
Atrial/Ventricular diastole	Open	Closed
Atrial systole	Open	Closed
Early Ventricular systole	Closed	Closed
Late Ventricular systole	Closed	Open
Atrial/Ventricular diastole	Open	Closed

e Explain the different roles of hormones and neurotransmitters on heart rate.

Adrenaline – released when stressed from adrenal gland, travels in blood to heart and causes increase in HR.Acetylcholine – released as neuro-transmitter of parasympathetic nerve (vagus nerve) at the SAN slows heart rate. Noradrenaline – released as a sympathetic neurotransmitter (cardiac nerve) at SAN increases HR.

Task 6 Summary of heart rate control and regulation

You are required to produce a guide in the form of a poster or PowerPoint presentation that shows how the heart rate is regulated and controlled in terms of the action of the heart during rest and exercise.

You will need to access information from the library using standard A-level P.E. textbooks and/or A-level Biology books. You may also find information on the internet at the following websites:

You may provide classroom material to be produced on a computer and delivered by a set date.

Part 9 Teaching Resource

‘Exercise Physiology Blood circulation’

General Considerations & Objectives

Learning objectives **What the students are expected to learn**

1. To permit students to acquire knowledge of circulatory physiology during rest and exercise.
2. To allow students to understand the link between physiology and performance.
3. To enable students to be able to apply this acquired knowledge to the development of their Personal Exercise Plan

Tasks **What the students are expected to do**

In this study pack you will find a range of tasks requiring the students to analyse a variety of physiological phenomena. They will need to:

- Identify the structures involved
- Determine the functions of the various components
- Understand the link between physiological effects and performance.

All the tasks require them to work either from the tasks as free-standing units, or to use the tasks as additional reinforcement to class-delivered lessons.

The student's work could simply be assessed as answers to questions, or it may be assessed as part of a groups work, or through class discussion.

The physiology of exercise may form a relevant component to the background research of their Personal Exercise Plan.

Be prepared to answer questions and to make suggestions.

A list is provided of a number of suitable textbooks. Your centre may also have suitable posters, videos that will help. Always remember that the teacher is ultimately the best resource. Independent learning does not mean don't ask me!

Task 1 The Circulatory System

Read the following passages and answer the questions that follow.

a The primary role of the circulatory system is to transport blood to all parts of the body. Typically each organ has a major **artery** supplying it with blood from the heart, and a major **vein**, which returns blood to the heart.

The artery branches into many smaller arterioles, which in turn supply dense networks of capillaries throughout the tissues of the organs.

It is from the capillaries that organs and tissues such as muscle, can gain the oxygen and nutrients they require, whilst at the same time allowing their waste products, such as carbon dioxide, to be removed.

Blood in the capillaries flows into the **venules** which join up to form the veins which return the blood to the heart.

i What is the major role of the circulatory system?

Transport of substances/nutrients/oxygen

ii Which of the following statements is not correct?

A Arteries carry more highly oxygenated blood than veins.

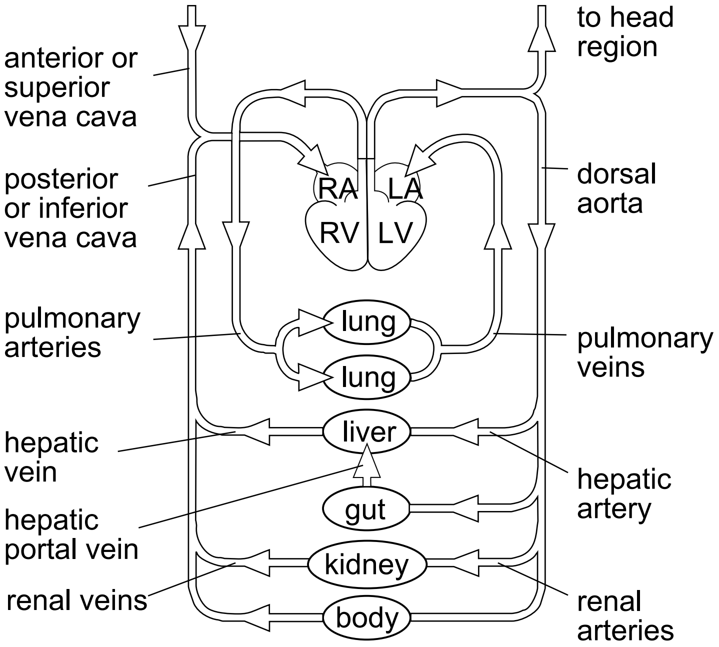
B Small veins branch into venules

C Arterioles lead into capillaries

D Capillaries link arterioles and venules

A Pulmonary arteries do not

b The diagram shows the double circulation


to head region
anterior or superior vena cava
posterior or inferior vena cava
dorsal aorta
RA
LA
RV
LV
pulmonary arteries
lung
lung
pulmonary veins
hepatic vein
liver
hepatic portal vein
gut
hepatic artery
kidney
renal veins
body
renal arteries

There are two circulation systems in man, so that blood follows a roughly figure of eight route around the body.

Blood flows from the heart to the lungs and back to the heart (the **pulmonary circulation**), and then from the heart to the rest of the body tissues and back to the heart again (the **systemic circulation**).

Blood circulates around the body in arteries, arterioles, capillaries, venules and veins.

Arteries and arterioles convey blood away from the heart and connect to beds of finely branching capillaries. There are so many capillaries in the body, that they cannot all be supplied with blood at the same time.

There is therefore, competition for blood between different regions of the body, especially during exercise, when blood must be **shunted** to the working muscles, and consequently withdrawn from other regions.

For example, when the body is at rest, about 45% of the cardiac output passes through the capillaries of the liver, gut and kidneys. During maximum exercise, this may be reduced to only 3%.

The shunting of blood between competing tissues is achieved by **constriction** (narrowing) and **dilation** (widening) of the arterioles that lead to the capillary beds.

Rings of circular muscle in these arterioles act as **sphincters**, which when contracted, shut off the blood supply to that particular capillary bed, and when these sphincters relax, blood flows into the capillary beds.

Control of this blood shunting is through the **sympathetic nervous system**. Stimulation by impulses from these nerves causes the smooth muscle in arterioles and the pre-capillary sphincters to contract and **vasoconstriction** occurs.

In cardiac muscle and skeletal muscle however, these same sympathetic nerves are **vasodilators**, increasing the diameter of the blood vessels supplying these tissues.

There are also local factors which have a direct effect on vasodilation in working muscles, these include a drop in oxygen and a rise in carbon dioxide levels, an increase in acidity, and others, which give a instantaneous vasodilation, because they are the result of muscle activity.

Table of estimated blood flow in cm^3 per minute

Organ system	At rest	%	Max. effort	%
Skeletal muscle	1000	20	26 000	88.00
Coronary vessels	250	5	1200	4.00
Skin	500	10	750	2.50
Kidneys	1000	20	300	1.00
Liver and Gut	1250	25	375	1.25
Brain	750	15	750	2.50
Whole Body	5000	1000	30 000	100.00

Notice the effect of the re-distribution of blood to the brain. The amount of blood remains unchanged.

It should also be noted that the above table applies to the trained individual. The effects are less obvious in the untrained person, with the effects on the kidneys and heart minimised, and the only major shunt being that to the working muscles.

i Suggest why the blood flow to the brain remains unchanged during exercise

Brain must have constant optimum supply for optimum function at all times

ii Explain why there is an increase in blood supply to the skin during exercise.

Exercise creates an increase in temperature as a result of
energy production. To keep the body’s temperature
constant, this excess heat must be lost.
This is a function of the skin, through evaporation of
sweat and vasodilation of arterioles to skin capillary
beds. Hence blood flow to skin increases during and
immediately following, exercise - more heat lost by
radiation.

iii Explain how the increase in blood supply to muscle capillary beds during exercise is achieved.

Arterioles supplying muscle capillaries have a ring of
circular muscle surrounding their distal end. This
relaxes through the action of sympathetic nerves
releasing noradrenaline to permit the arteriole to
dilate and so increase the supply of blood to the
capillaries

iv Explain why there is a need for blood flow to muscles to increase during exercise.

Blood carries the oxygen that is required by the
muscles to release the energy needed for muscle
contraction, and removes the carbon dioxide
produced.

e

v Why is blood flow to the liver and kidney reduced during exercise?

The normal functions of the liver and kidney are continued during exercise, but at a greatly reduced intensity, hence there is less blood required. This in turn allows more blood to be diverted to the working muscles.

vi Explain the significance of the increased flow to the coronary vessels during exercise.

The heart works harder during exercise to pump more blood around the body. The heart is itself a muscle and requires nutrients, especially glucose and oxygen. During exercise this need increases, and hence more blood flows through the coronary vessels that supply blood to the heart tissue

Task 2 Blood Pressure and Velocity

Read the following descriptions and answer the following questions.

a As the heart pumps blood through the body's blood vessels, the vessels offer resistance to the flow of blood, and this creates a pressure, the **blood pressure**.

The blood pressure varies according to whether the heart is contracting (systole) and forcing blood through the vessels, or relaxing (diastole).

Hence there is a higher **systolic** and a lower **diastolic** pressure.

i Explain why blood in the blood vessels is under pressure.

The heart pumping and the blood vessels offering a resistance creates the pressure

ii Explain why there are two blood pressures.

The heart contracts and relaxes, causing two pressures

b Blood pressure is dependent on the cardiac output and the resistance to flow of the blood vessels, more properly called the peripheral resistance, such that:

Blood Pressure = Cardiac Output x Peripheral Resistance

The peripheral resistance is the resistance to flow of the blood in the blood vessels. If blood vessels constrict (e.g. as a result of anxiety) the resistance increases and therefore the blood pressure also increases. If the blood vessels dilate, and capillary beds open, the resistance and pressure decrease.

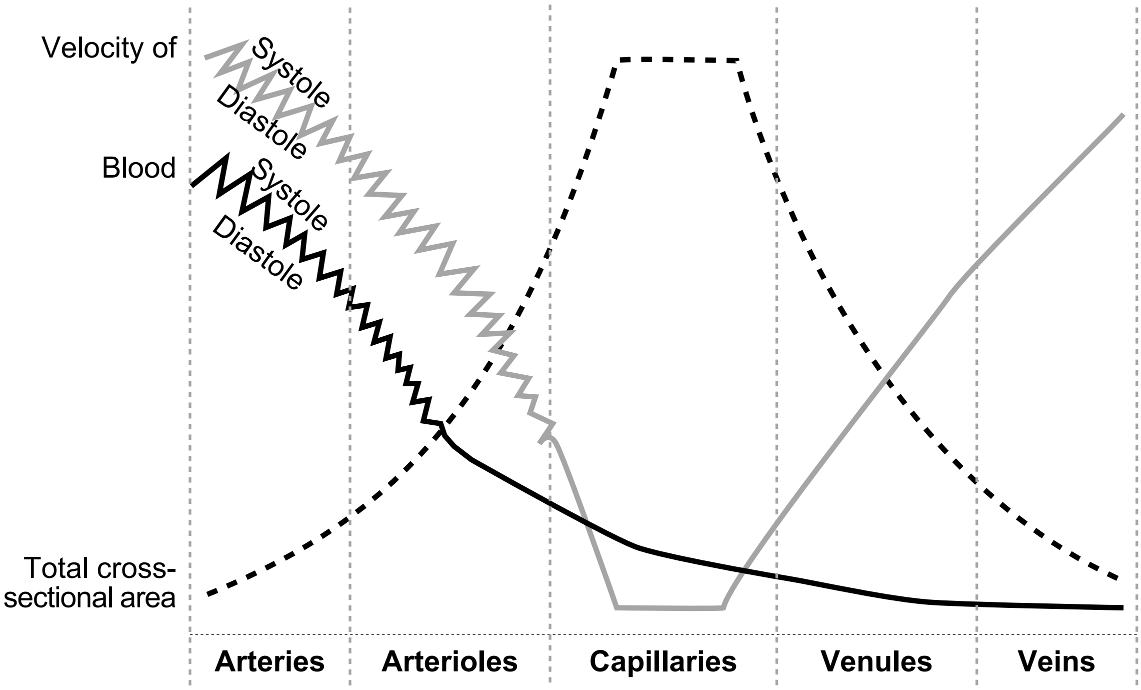
Blood pressure decreases the further blood flows away from the heart. This is mainly as a result of the total cross sectional area of the blood vessels increasing with distance from the heart, and that pressure is lost overcoming the friction with the lining of the blood vessels. There is no pulsing of the blood in the capillaries, venules and veins, as the pressure surge caused by the contraction of the heart is spent.

Thus, blood pressure decreases as we move from arteries to arterioles to capillaries to venules to veins.

The velocity of the blood also decreases as we move away from the heart, with blood in the capillaries flowing very slowly.

However the blood speeds up as it enters the venules and veins because the total cross-sectional area **decreases** in these vessels.

These changes in blood pressure, velocity and total cross-sectional area are shown in the graph below.



i Use the graph shown to explain why, as the blood flows through the circulatory system from the heart, the velocity of the blood decreases and then increases.

The velocity of the blood decreases as it moves away from the heart because of the increasing total cross-sectional area of the arterioles and capillaries, and then increases because the total cross sectional area of the venules and veins decreases.

ii Explain why it is an advantage that the blood flows most slowly through the capillary beds.

The capillary beds are the sites for exchanges by diffusion between the blood and the tissues. The slower the flow, the more time there is for these exchanges to occur, especially in the lungs and the muscles during exercise.

c The pressure in the large veins is so low that it is insufficient to return the blood to the heart, unless there was some mechanism to aid this **venous return**.

Veins have one-way valves to prevent the back flow of blood.

The most important mechanism for venous return is the **skeletal muscle pump**.The majority of our major veins lie either in-between muscles, or between muscles and bones. When we contract these muscles, the veins, being thin-walled, are squeezed and compressed. This action pushes the blood back towards the heart, because the valves in the veins prevent flow in the other direction Exercise increases this effect. However if you suddenly stop exercising, the skeletal muscle pump slows, even though the heart is still working hard whilst you recover.

This results in blood "**pooling**" in the muscles of the legs, which means that less is reaching the heart, and therefore less is being pumped out.

The first organ to suffer from a lack of blood is the brain, and athletes can get dizzy or even faint from this mechanism, because of a lack of oxygen supply to the brain. This emphasises the need for a "cool down" after exercise to prevent venous pooling.

The second mechanism for returning blood to the heart is the **respiratory pump**.

When breathing-in the diaphragm flattens downwards, decreasing the pressure in the thorax (chest) and increasing the pressure in the abdomen. These pressure changes act on the veins to aid blood flow towards the heart.

i Explain the mechanism of venous return

Muscle pump / compression of veins due to contractions of surrounding skeletal muscles / one way valves / respiratory pump - breathing movements additional forces moving blood towards the heart.

ii Explain why it is best to keep moving after a bout of strenuous exercise, rather than stopping suddenly.

Stopping suddenly would result in blood 'pooling' in the legs and a decrease in venous return, which in turn will reduce the output of the heart, and blood supply to the head (causing fainting) and the body (delaying the recovery from exercise)

Part 10 Teaching Resource

‘Exercise Physiology Gas Exchange’

General Considerations & Objectives

1. To permit students to acquire knowledge of respiratory physiology during rest and exercise.

2. To allow students to understand the link between physiology and performance.

3. To enable students to be able to apply this acquired knowledge to the development of their Personal Exercise Plan

Tasks

In this study pack you will find a range of tasks requiring the students to analyse a variety of physiological phenomena. They will need to:

- Identify the structures involved
- Determine the functions of the various components
- Understand the link between physiological effects and performance.

All the tasks require them to work either from the tasks as free-standing units, or to use the tasks as additional reinforcement to class-delivered lessons.

The student's work could simply be assessed as answers to questions, or it may be assessed as part of a groups work, or through class discussion.

The physiology of exercise may form a relevant component to the background research of their Personal Exercise Plan.

Be prepared to answer questions and to make suggestions.

A list is provided of a number of suitable textbooks. Your centre may also have suitable posters, videos that will help. Always remember that the teacher is ultimately the best resource. Independent learning does not mean don't ask me!

Task 1 Transport of Respiratory Gases

Read the following passages and answer the following questions.

a Oxygen transport

Oxygen is slightly soluble in plasma, and approximately 7% of the oxygen entering our blood is carried in this way. The remainder is carried in combination with the red pigment **haemoglobin** that is found in red blood cells.

Each haemoglobin molecule is able to carry a maximum of four molecules of oxygen:

Hence: $Hb + 4O_2 \leftrightarrow HbO_8$ (**oxyhaemoglobin**)

This reaction is easily reversible.

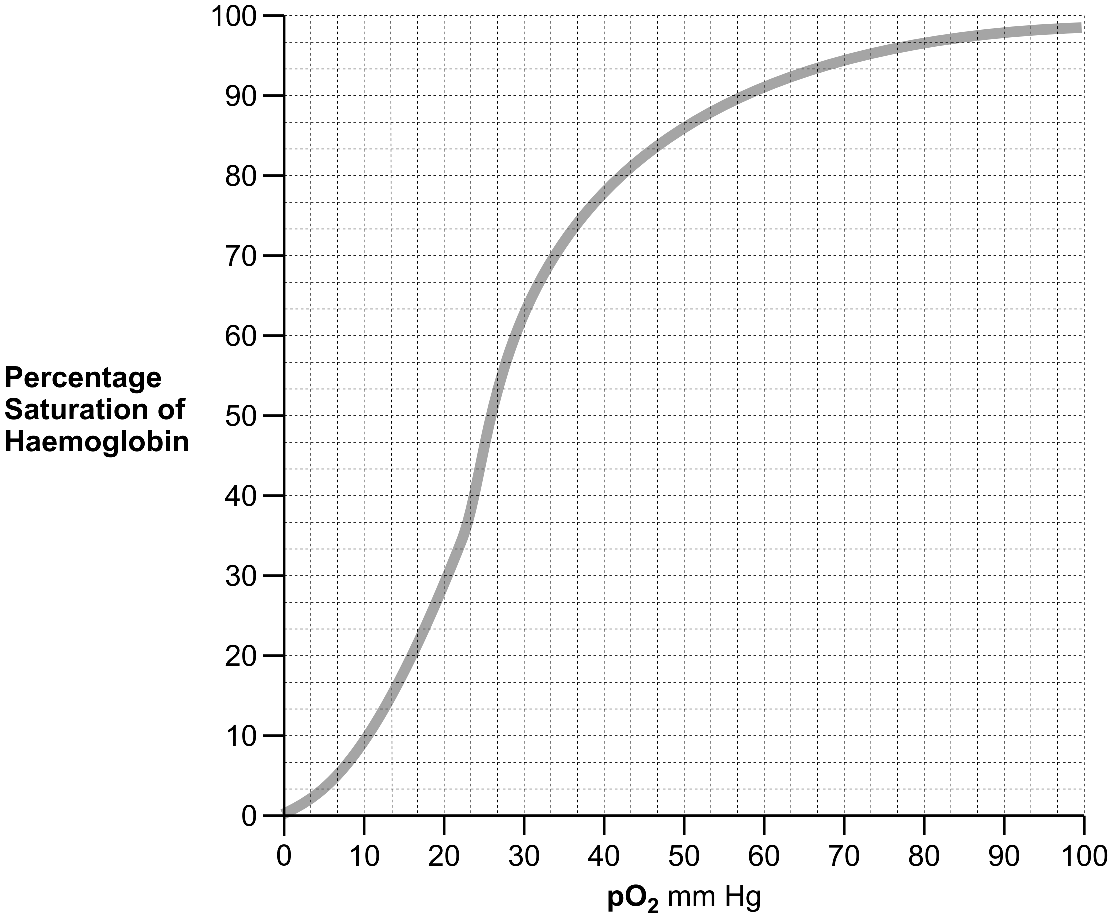
The amount of oxygen combining with haemoglobin depends on the concentration or **partial pressure of oxygen** (pO_2).

When all the haemoglobin is converted to oxyhaemoglobin, then the haemoglobin is said to be **fully (100%) saturated** with oxygen. This occurs when pO_2 is high, as for example is the case when the blood is flowing through the lungs.

At lower pO_2 the percentage saturation of haemoglobin is lower, as for example when the blood is flowing through actively respiring tissues (muscles).

Hence at tissues, the nearly 100% saturated haemoglobin gives up its oxygen to the surrounding cells, and its percentage saturation decreases to below 50%; and on returning to the lungs, where the pO_2 is higher, the haemoglobin picks up more oxygen. These changes can be represented in an oxyhaemoglobin association/dissociation curve:

e



i What is the significance of the shape of the oxyhaemoglobin association/dissociation curve?

Small changes in pO_2 results in large release of oxygen at tissues and large uptake at lungs / haemoglobin thus a very efficient respiratory pigment

ii What effect on performance do you think will be the outcome of males normally having a higher level of haemoglobin than females, as well as a greater blood volume?

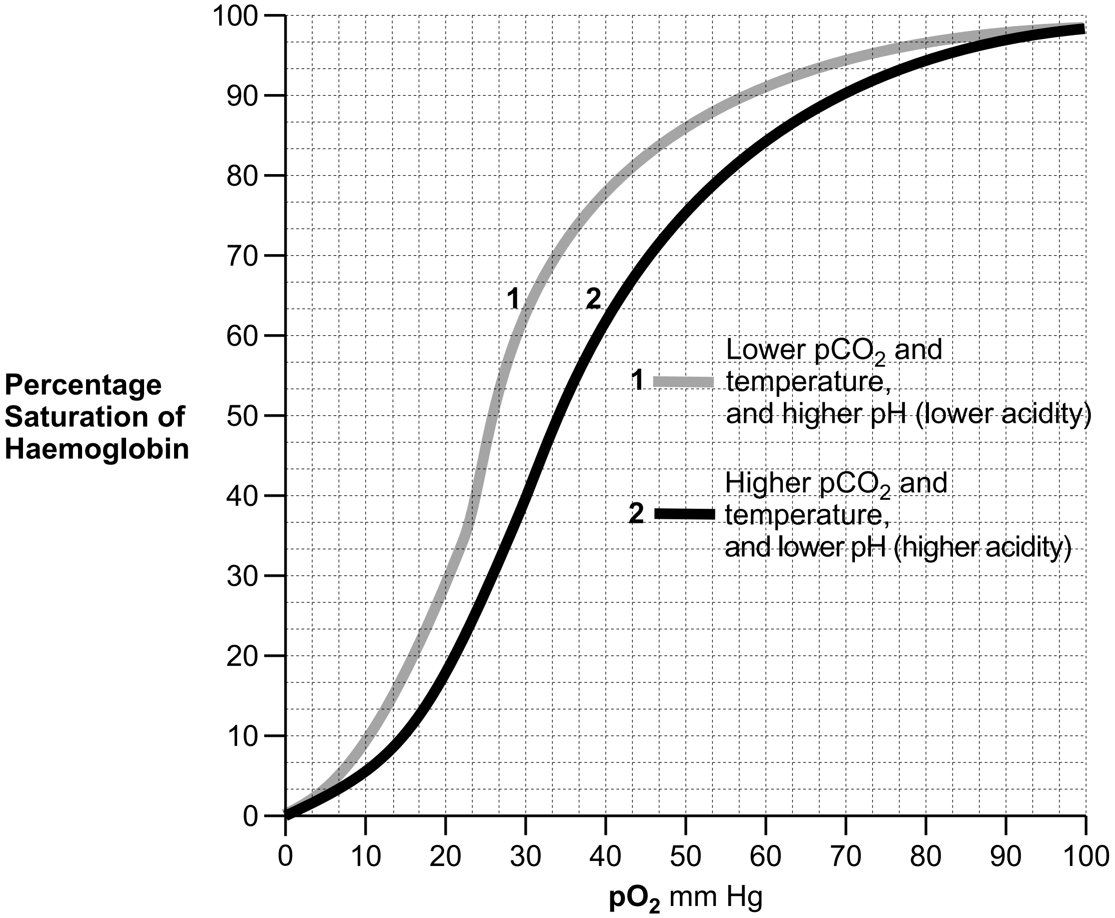
Males generally have higher aerobic endurance capacities.

b Release of oxygen to the tissues

Gaseous exchange at the tissues (muscles) is mainly dependent on the partial pressure gradient between the blood and tissues for the gases concerned.

When muscles are exercising, the pO_2 within the muscles decreases and this increases the diffusion gradient between the muscles and the blood.

The increase in diffusion gradient, and other factors that occur with exercise, such as increased temperature, and a decrease in pH, encourage oxygen to be released from the oxyhaemoglobin in the red blood cells and to diffuse into the muscles from the blood.



i Explain the decrease in pH that occurs during aerobic exercise:

Production of carbon dioxide through aerobic energy release.

continued....

ii Explain the decrease in pH that occurs during anaerobic energy release.

Production of lactic acid through anaerobic energy production.

iii Draw a vertical line from the horizontal axis at a pO_2 of 20 mm Hg, and by horizontal lines across to the vertical axis, estimate how much **extra** oxygen is released to the tissues as a result of the Bohr shift.

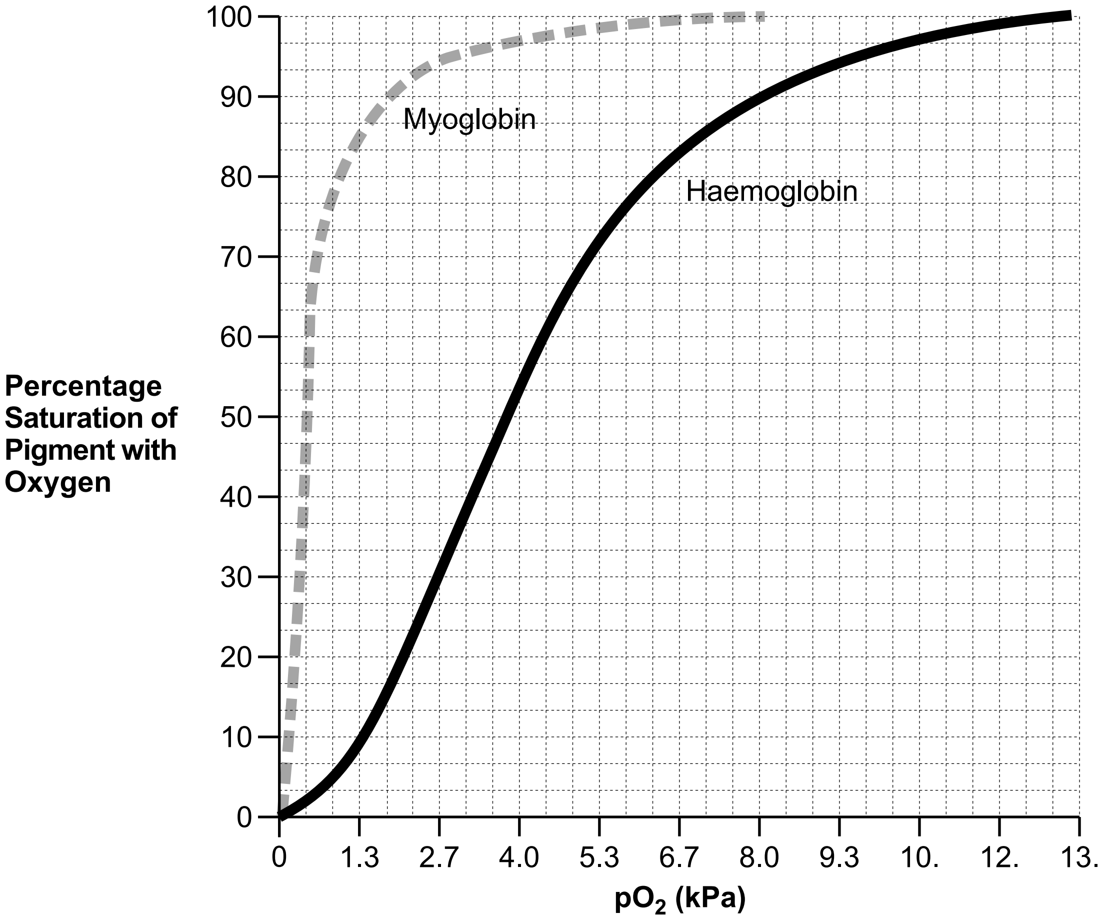
10%

c Muscle pigment

In order to make sure that sufficient oxygen is available to working muscles, another respiratory pigment is involved, namely **myoglobin**.

Myoglobin is found only in muscles. Myoglobin has a higher affinity for oxygen than haemoglobin, and therefore it picks up the oxygen released from haemoglobin, and makes it available to the muscles.

Myoglobin acts like a reservoir for oxygen should the muscle begin to contract. The association/dissociation curve for myoglobin is shown with that for haemoglobin below:



i Describe the function of myoglobin

Myoglobin is a pigment found in muscle that makes oxygen available within the muscle, essentially acting as an oxygen store, picking up the oxygen from the haemoglobin and providing it for the exercising muscles.

ii Explain the significance of the shape of the association/ dissociation curve of myoglobin.

The shape of the curve means that even if the percentage saturation of haemoglobin with oxygen is low, myoglobin remains fully saturated with oxygen, and hence the muscle continues to be supplied with oxygen

d The effect of altitude

The table contains data on the barometric pressure, pO_2 and corresponding % saturation of haemoglobin with oxygen, linked to changes in altitude.

Height (m above sea level)	Barometric pressure (mm Hg)	Inspired O_2 pressure (mm Hg)	% saturation of haemoglobin with O_2
Sea level	760	150	98
1000	674	130	97
2000	596	110	95
3000	526	97	90
4000	462	85	85
5000	405	75	78
6000	354	65	70

i Study the table and explain why endurance athletes may suffer a deterioration in performance when participating at altitude.

Increase in altitude means that the air pressure and hence pO2 is lower. This means that the pO2 in the alveoli is lower and thus less oxygen is picked up by the haemoglobin (the haemoglobin is not fully saturated). When this blood reaches the tissues, there is less oxygen given up for use in the muscles to release energy, so that endurance performance is affected through lack of oxygen

continued....

ii Explain why the energy release of power athletes is not affected at altitude

Power involves rapid anaerobic energy release that does not involve oxygen.

e **Carbon Dioxide Transport**

Carbon dioxide is transported both in the plasma and in the red blood cells.

10% dissolves in plasma as carbon dioxide.

20% combines with proteins, including haemoglobin in red blood cells (forming carbaminohaemoglobin).

70% is transported as hydrogen carbonate ion (bicarbonate ion).

In red blood cells, the carbon dioxide combines with water to form carbonic acid, which readily dissociates into hydrogencarbonate and hydrogen ions:

$CO_2 + H_2O \leftrightarrow H_2CO_3 \leftrightarrow H^+ + HCO_3^-$

The excess H^+ is **buffered** by the haemoglobin, thus preventing the blood from becoming too acidic. This also helps the dissociation of the oxyhaemoglobin.

i Describe the three ways in which carbon dioxide may be transported in the blood.

Majority (70%) as hydrogencarbonate ions, some (10%) dissolved in plasma, some (20%) combined with proteins, including haemoglobin (as carbaminohaemoglobin).

ii What is the ultimate fate of the carbon dioxide carried in the blood?

Diffuses into the lungs to be exhaled

Task 2 Lung Volumes

Read the following passages and answer the following questions.

a Breathing volumes

The volumes of air breathed in and out in different circumstances may be measured using a **spirometer**. The subject breathes in and out of a sealed chamber through a mouthpiece.

As the chamber inflates and deflates, a pen recorder traces out the breathing movements on to a chart. The machine is calibrated so that breathing volumes can be calculated.

Ventilation is said to be **tidal** (air moves in and out). The amount of air breathed in and then breathed out in a normal cycle is called the **tidal volume**, usually about 500 cm^3.

We are able to breathe in and out to a greater extent, and these extra supplies of air are called the **inspiratory reserve volume**, and the **expiratory reserve volume**, respectively.

During exercise the tidal volume increases, making use of both the inspiratory and expiratory reserve volumes. All three volumes together add up to the **vital capacity** - the maximum possible tidal volume - usually about 4 - 5 dm^3.

When we breath out as hard as we can, there is still some air in the lungs, this is called the **residual volume**, add this to the vital capacity and we have the **total lung volume**, usually between 5 – 7 dm^3.

Some of the air we breathe in does not reach the alveoli, but remains in the air passages, occupying the so-called **dead space**. These volumes and the effects of exercise are shown on the following spirometer trace:

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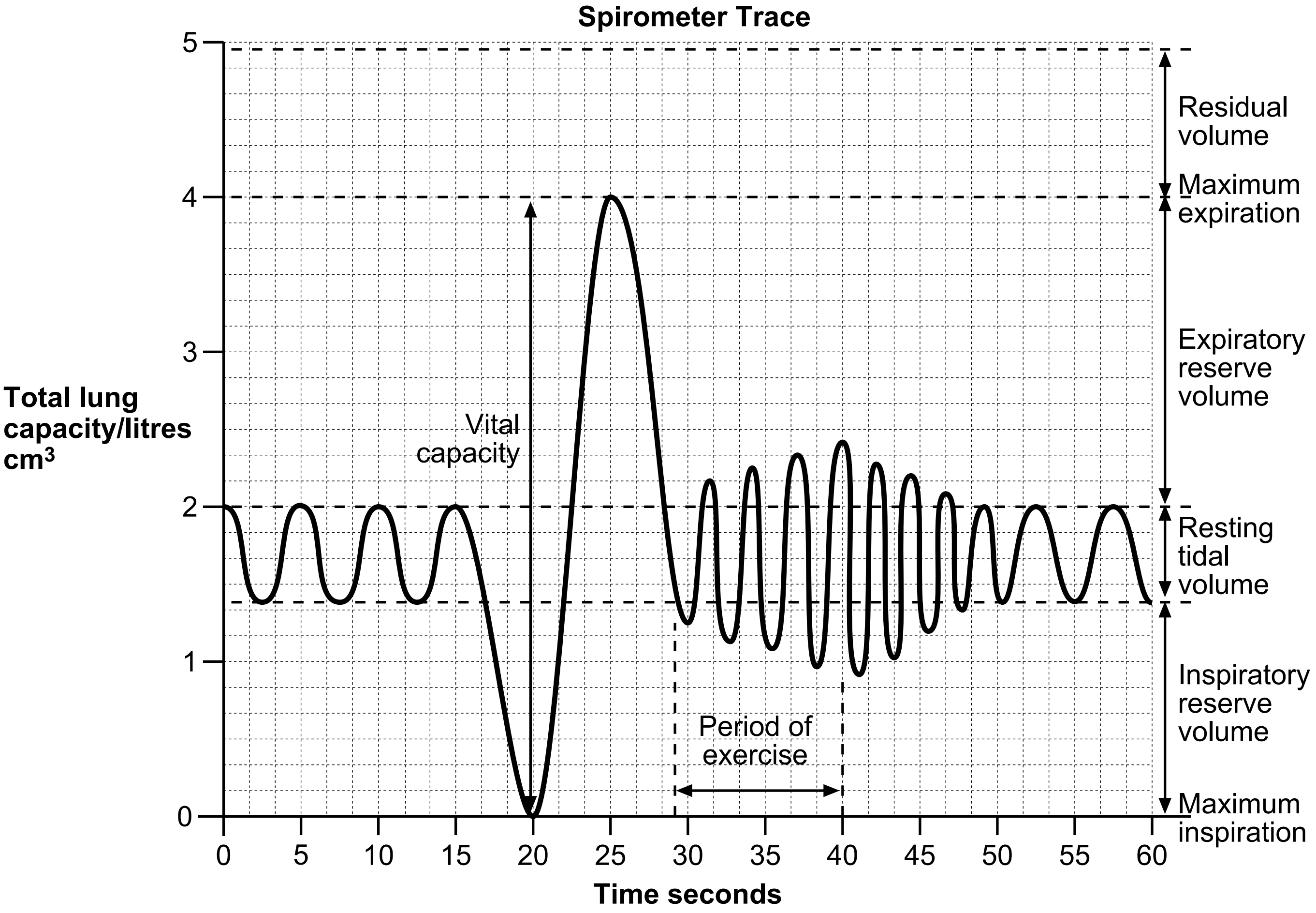


Box-type spirometer where the trace moves down on inspiration and up on expiration. Cylinder-type spirometers move in the same way but the trace is inverted.

i Use the graph to calculate the vital capacity of the subject.

3.5 litres

ii Describe in your own words the effect of exercise on the tidal volume

Exercise causes an increase in tidal volume

iii Describe the effect of exercise on the inspiratory and expiratory reserve volumes?

Exercise causes a decrease in both the inspiratory and expiratory reserve volumes

iv The **minute volume** or **minute ventilation** is a measure of the amount of air that is breathed in one minute.

Minute volume = tidal volume x breathing rate

With tidal volume being measured in litres and breathing rate in breaths per minute, ventilation rate must have units of litres per minute. Notice the similarity between this formula and that for cardiac output.

Calculate the minute volume at rest and during exercise of the subject whose spirometer readings are shown in Task 2 part a.

Minute volume at rest =
tidal volume (0.6) x breathing rate per minute (12)
= 7.2 litres per minute.
During exercise minute volume is 1.2 x 24 =
28.8 litres per minute

v What do we call the air that that is not moved as a result of breathing movements?

Stationary air

vi Explain why the lungs are never completely emptied.

They would collapse and be impossible to reinflate.

vii What do we call the air that remains in the lungs after the deepest possible breath out (expiration)?

Residual volume

b Control of Breathing

The muscles controlling breathing are regulated by nerve impulses from the respiratory centre in the medulla of the brain. This respiratory centre is thought to have two sub-systems, one for causing inspiration, and the other for expiration.

This control is normally sub-consciously controlled, but can be modified through conscious control (e.g. holding your breath and during speech), or through changing circumstances (e.g. exercise).

The respiratory centre responds to a variety of different sensory signals that indicate changes in the body that demand alterations to our breathing pattern. The most important of these is a change in the hydrogen ion **(H+) concentration** in the blood, in other words, the blood's **pH** or acidity/alkalinity.

During exercise, lactic acid and carbon dioxide (which forms carbonic acid) are produced as waste products, and result in an increase in H^+ concentration (the blood becomes more acidic, the pH decreases).

The respiratory centre responds to this by increasing the rate and depth of breathing.

In the neck, the carotid arteries contain **chemoreceptors**, which can detect changes in the blood's acidity, as well as changes in the oxygen concentration, and information about these changes is also sent to the respiratory centre.

The basic aim of the body is to make sure that sufficient oxygen is getting to cells, whilst at the same time making sure that carbon dioxide levels do not get too high.

Other factors affecting respiratory rate include:

detection of changes in blood pressure by **baroreceptors**

detection of changes in body temperature

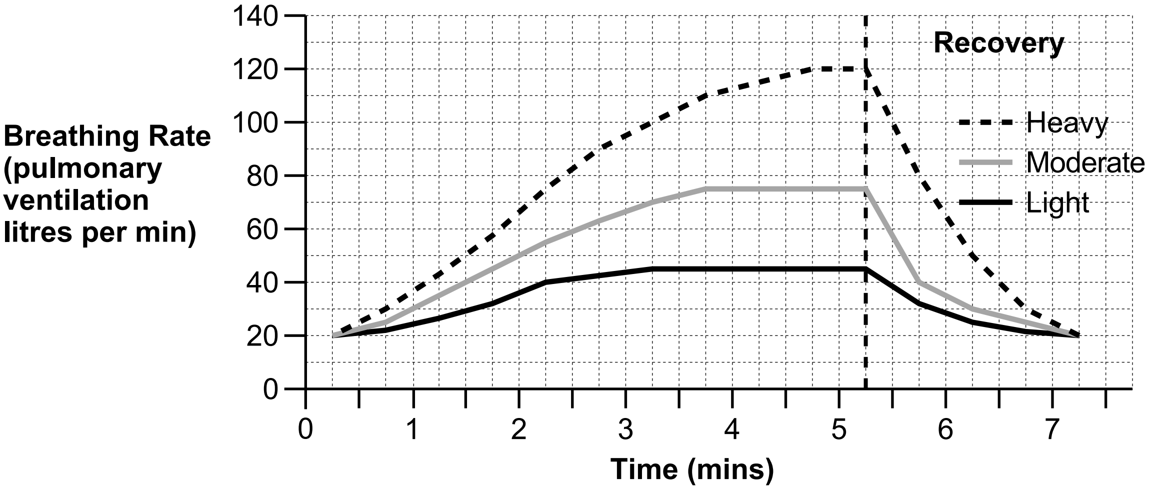
stretch receptors in the walls of the air passages are stimulated by over-stretching during inspiration, send impulses to the respiratory centre, causing expiration.

This is the Hering-Breuer reflex.

i Explain in your own words how the rate and depth of breathing are regulated.

Exercise causes an increase in lactic acid and carbon dioxide levels in the blood which are detected by chemoreceptors. In turn, these send nerve impulses to the respiratory centre in the medulla to increase the rate and depth of breathing

ii The following diagram shows how ventilation rate varies with duration and intensity of exercise:



Explain why the pulmonary ventilation (breathing rate) at the two lower rates of exercise level off before the end of exercise, but not at the heavy rate.

Increased ventilation rates are sufficient to establish equilibrium in the supply of oxygen to, and the removal of carbon dioxide from, the exercising muscles at the two lower rates, but not at the higher rate where the breathing rate continues to increase in trying to meet the demand.

Task 3 Gaseous Exchange

Read the passages and answer the following questions.

There are two locations for gaseous exchange. Gas exchange occurs between the air in the alveoli of the lungs, and the blood in the capillaries that surround the alveoli. Gas exchange also occurs at all those tissues that have a demand for oxygen and that produce carbon dioxide. In terms of this subject, that essentially means gas exchange between the blood capillaries within muscles, and the muscle tissue itself.

a Diffusion of gases

Gases will move by diffusion from a region of higher concentration to a region of lower concentration, until equilibrium is reached. An increase in temperature speeds up the rate of diffusion.

With regard to gases, the correct terminology is not concentration, but partial pressure (pO_2 and pCO_2), which is dependent both on the concentration of a gas, and its barometric pressure. The units of partial pressure (p) are either millimetres of mercury (mm Hg) or kilo Pascals (kPa).

i What do you understand by the term partial pressure

Pressure of a gas in a mixture of gases

ii What factors affect the rate of diffusion of a substance?

Difference in concentrations (partial pressures);
distance apart/thickness of membrane; temperature;
contact surface area

b Gaseous exchange in alveoli

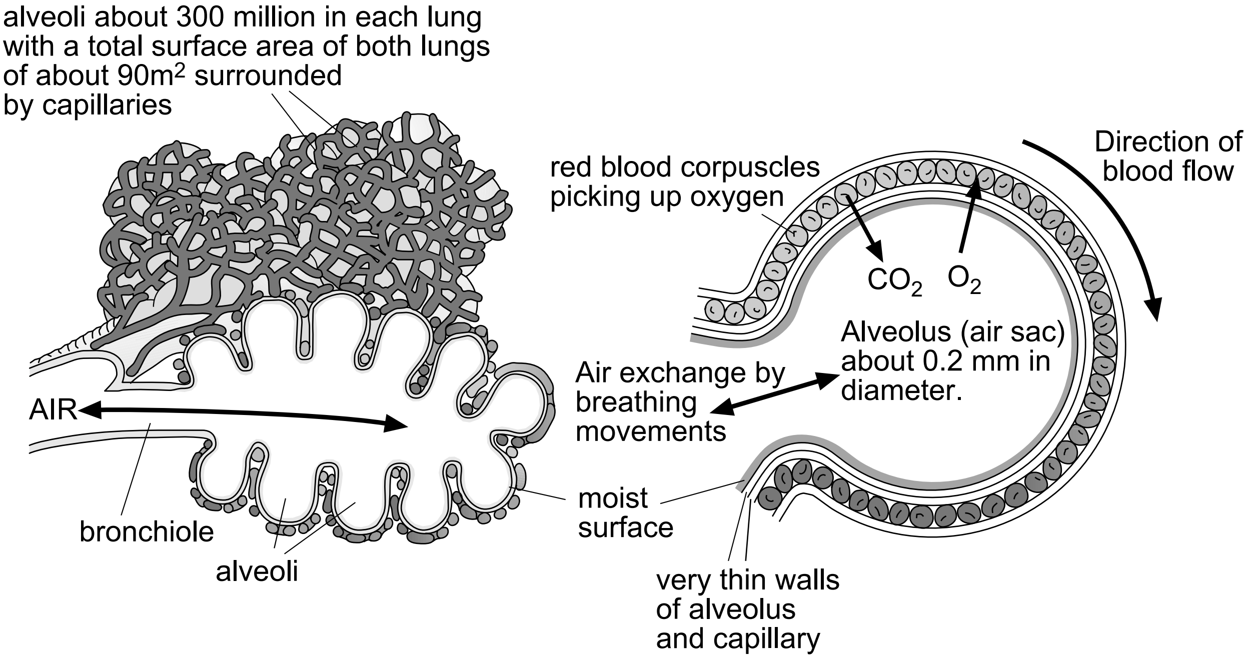
Blood that enters the capillaries surrounding the lung's alveoli has a lower oxygen and higher carbon dioxide content than the air in the alveoli. Therefore diffusion occurs, with oxygen moving from the alveoli into the blood, and carbon dioxide moving from the blood to the alveoli.

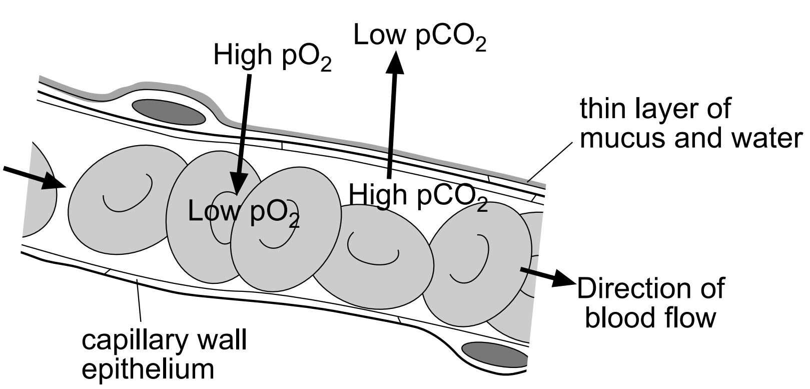
Both these involve the gases moving down a partial pressure gradient.

During diffusion, oxygen must pass through a layer of moisture, the alveolar membrane, the thin wall of the blood capillaries, the plasma, and through the membrane of the red blood cells. Carbon dioxide diffuses in the opposite direction.

This diffusion is facilitated by having a vast network of alveoli and surrounding blood capillaries, hence producing a large surface area for diffusion. Also the exceptionally thin alveolar and capillary membranes reduce the diffusion distance between the air in the alveoli and the blood, and the relatively slow passage of red blood cells through the blood capillaries (the transit time) allows time for diffusion to occur, even during maximum exercise.

The rate of diffusion is approximately 250 cm^3 of oxygen per minute whilst at rest, but can increase to values of over 5 litres (dm^3) of oxygen per minute during exercise.


alveoli about 300 million in each lung with a total surface area of both lungs of about 90m^2 surrounded by capillaries
AIR
bronchiole
alveoli
red blood corpuscles picking up oxygen
Direction of blood flow
CO_2
O_2
Alveolus (air sac) about 0.2 mm in diameter.
Air exchange by breathing movements
moist surface
very thin walls of alveolus and capillary


ALVEOLUS
High pO_2
Low pCO_2
thin layer of mucus and water
Low pO_2
High pCO_2
Direction of blood flow
capillary wall epithelium

i Use the diagram to explain how the rate of diffusion of the respiratory gases is assisted by the structures within the lungs.

Small diffusion distance, large alveolar/capillary contact area;

ii Explain why all the oxygen in the air could not be taken up by diffusion into the blood.

Diffusion only occurs with a diffusion gradient, equilibrium is reached before all the oxygen could be removed.

c Oxygen and carbon dioxide composition of air and blood

As we breathe in and out, so the composition of the air changes as shown below:

Comparison of the percentage composition of inspired and expired air.

Constituent	Inspired Air	Expired Air
	% gases	
Oxygen	21	16.4
Carbon Dioxide	0.04	4.0
Nitrogen	79	79.6
Water Vapour	variable	saturated

The air we breathe out is a mixture of air from the alveoli and air that previously occupied the dead space. Similarly, not all the air we breathe in reaches the alveoli, as it mixes with the air remaining in the lungs from the previous expiration.

i Explain why the % oxygen in expired air decreases by about the same amount that % carbon dioxide increases.

The oxygen is used in aerobic oxidation of energy reserves which produces an equivalent volume of carbon dioxide which must be expired.

continued....

ii Explain why the % nitrogen remains virtually unaltered in both inspired and expired air.

Nitrogen is an inert gas that plays no part in metabolism

b Arterio-venous difference

The muscles (tissues) take up oxygen from the blood. This means that there is a difference in the amount of oxygen in arterial blood arriving at the muscles, compared to that in venous blood that is leaving the muscles.

This **arterio-venous difference** or **a-vO_2 diff per 100 cm^3 blood** depends on the level of oxygen extraction by the tissues. At rest, the a-vO_2 diff is low, but during exercise muscles extract large amounts of oxygen from the blood, and hence the a-vO_2 diff is high.

This increase in a-vO_2 diff affects gaseous exchange at the alveoli, because venous blood returning to the lungs during exercise has correspondingly more carbon dioxide and less oxygen, thus increasing the diffusion gradients for these gases.

Training increases the a-vO_2 diff, as trained individuals can extract more oxygen from blood.

Differences in oxygen and carbon dioxide content of arterial blood and venous blood:

	Arterial blood		**Venous blood**	
	cm^3 per 100 cm^3 blood	mm Hg	cm^3 per 100 cm^3 blood	mm Hg
O_2	19.0	96.0	12.5	40.0
CO_2	50.0	40.0	56.0	46.0

i For what reasons are the levels of oxygen and carbon dioxide in arterial blood different from those in venous blood?:

Carbon dioxide levels higher – produced as a waste product of aerobic energy release; oxygen levels lower - used to release aerobic energy

ii Explain why trained individuals have a higher a-vO_2 diff than untrained.

Increased blood supply to muscles (capillarisation); increased numbers of mitochondria able to extract more oxygen

Part 11 Teaching Resource

‘Exercise Physiology the Effects of Training’

General Considerations & Objectives

1 To permit students to acquire knowledge of the effects of training on cardiac and respiratory physiology

2 To allow students to understand the link between physiology and performance.

3 To enable students to be able to apply this acquired knowledge to the development of their Personal Exercise Plan

Tasks

In this study pack you will find a range of tasks requiring the students to analyse a variety of physiological phenomena. They will need to:

- Identify the structures involved
- Determine the functions of the various components
- Understand the link between physiological effects and performance.

All the tasks require them to work either from the tasks as free-standing units, or to use the tasks as additional reinforcement to class-delivered lessons.

The student's work could simply be assessed as answers to questions, or it may be assessed as part of a groups work, or through class discussion.

The physiology of exercise may form a relevant component to the background research of their Personal Exercise Plan.

Be prepared to answer questions and to make suggestions.

A list is provided of a number of suitable textbooks. Your centre may also have suitable posters, videos that will help. Always remember that the teacher is ultimately the best resource. Independent learning does not mean don't ask me!

Task 1 Long Term Effects of Training on the Heart

a Produce and complete a simple questionnaire that may be used to identify which members of your P.E. group have been regular participants in training for their sporting activities over the past few years, and on the basis of this questionnaire, divide the class into two groups, regular participants and non-regular participants.

Note that in some centres there may well be a need to bring in non-P.E. students to provide a large enough sample of non-participants

Each group should then have their resting heart rates/pulse rates measured. Hand timing using the radial or carotid pulse is adequate, but a pulseometer is more accurate. To make sure that all readings are taken under the same circumstances, ensure all subjects are seated, and that they are allowed to relax for five minutes before the counting of the heart rate begins.

Results should be recorded and the mean/average worked out for each group and entered below.

Group	Average resting heart rate
Regular participants	
Regular non-participants	

continued....

Answer the following questions

i What difference does it make whether the subject is standing, seated, or lying down when their pulse rate is taken?

Pulse rate higher when standing, lower when seated and when lying down, – due to influence of heart having to work against gravity when standing

ii Why is there a need to allow the subject to relax for five minutes before taking a heart rate reading?

The thought of having heart rate measured and/or the thought of exercising (or any form of stress) will cause increased sympathetic nervous activity and the release of the hormone adrenaline, causing an immediate increase in heart rate

b Each group should then undertake a single specific exercise programme lasting several minutes, but the programme must be measured, repeatable and sub-maximal. This could involve a modified step-test on to a bench at a specified rate for a known duration, or cycling on an exercise bike or ergometer at a known workload for a stated time, or even the whole group jogging at the same pace for the length of time.

The heart rates/pulse rates of each subject should then be taken immediately after the exercise has finished.

The results should once again be recorded and the mean/average worked out for each group and entered below.

Group	Average post-exercise heart rate
Regular participants	
Regular non-participants	

Answer the following questions;

i Compare the mean resting heart rates between the two groups. Is there a difference?

If there is, what is it and can you explain why?

Resting heart rates of untrained group should be higher (trained group lower). This is due to training increasing the efficiency of the heart which means it can pump out the same amount of blood (cardiac output) with fewer beats

f Now compare the mean post-exercise heart rates between the two groups. Is there a difference? If there is, what is it and can you explain why?

Rates of trained group are lower (untrained higher). This is due to training increasing the efficiency of the heart which means it can pump out the amount of blood (cardiac output) the muscles require (oxygen) with fewer beats

Task 2 Long Term Effects of Training on the Cardiovascular and Respiratory Systems

Read the following passages and answer the questions in the spaces provided.

The long-term effects of training (chronic effects) occur only after weeks or even months of training, and remain as permanent features until training ceases. They include effects on the circulatory and respiratory systems, and the skeletal system. These effects are evident at rest and during different levels of exercise.

a The following effects are evident at rest

Cardiac hypertrophy Over a long period training increase the size of the heart. In endurance-trained athletes, this increase is due to an increase in the size of the ventricles.

i Why does endurance training primarily affect the ventricles?

Ventricles pump blood to lungs and 'body', which are involved in endurance exercise

Increased stroke volume The larger chambers of endurance athletes brought about by cardiac hypertrophy increases the stroke volume of the resting heart, because the bigger chamber will allow more blood to enter the chamber whilst it is filling, and a corresponding increased amount leave when the heart contracts (increased contractility).

e

ii What do you understand by the term stroke volume?

volume of blood leaving left (or right) ventricle per beat of the heart

iii Explain how stroke volume and heart rate are related.

S.V. x H.R. = Cardiac Output (Q for quantity)

S.V. = Q/H.R.

H.R. = Q/S.V.

Increased ejection fraction

The thicker muscle of the trained athlete will produce stronger contractions of the ventricles (increased contractility), and therefore eject a larger proportion of the blood that is in the ventricle, which results in a similar increased stroke volume through increasing the proportion of blood leaving the heart.

iv Explain how an increase in contractility and ejection fraction affects the stroke volume?

Only a proportion of blood in ventricle leaves heart following a contraction – increased proportion (ejection fraction) increases SV; similarly.

Decreased resting heart rate (Bradycardia)

As the demand for blood whilst at rest remains constant, so does the cardiac output. However, the increase in stroke volume described above, means that there will be a corresponding decrease in resting heart rate, because Q/SV = HR

v What affect does bradycardia have on resting cardiac output?

Because resting cardiac output remains essentially the same following training, bradycardia has little or no effect

Increased blood volume and haemoglobin

Training causes an increased production of blood plasma and red blood cells, thus increasing the overall blood volume, and increasing the haemoglobin content, and hence the oxygen-carrying capacity of the body.

vi Explain the role of haemoglobin in the release of energy from energy stores within muscles.

Haemoglobin transports oxygen to the working muscles. These muscles will then use the oxygen to release energy

Decreased resting blood pressure

High blood pressure at rest (hypertension) is decreased by training.

Respiratory effects

Training causes slight increases in the **inspiratory** and **expiratory reserve** and therefore the **vital capacity**. There is also an increase in the efficiency of the oxygen diffusion capacity of the lungs.

vii How are the vital capacity, expiratory reserve volume, inspiratory and expiratory reserve volumes and tidal volume related?

Vital capacity = Expiratory reserve volume + Inspiratory reserve volume + tidal volume

Reduced levels of blood cholesterol

These fatty materials are carried by proteins in the plasma of the blood in various forms. They are associated with **coronary heart disease** (CHD)

Changes in body composition

Decreased levels of body fat, no change or slight increase in lean body mass.

continued....

viii Explain why despite reducing body fat as a result of exercise, body mass (weight) may not decrease.

Reduction in mass of fat offset by increase in lean body mass of muscle (which is proportionally heavier than fat).

Strengthening of bone, ligaments and tendons The stress of exercise leads to increased protein accumulation within these tissues that strengthens and thickens them. Training also leads to the thickening of the articular cartilage at the ends of long bones, thus providing better cushioning effects.

ix Use the information provided so far to suggest the physiological benefits of exercise to health.

Reduced hypertension; reduced levels of cholesterol, reduced body fat, reduced risk of CHD and stroke.

b The following effects are evident during sub-maximal exercise.

Reduced heart rate As the cardiac output at any level of exercise before and after training remains fairly constant, the heart rate during sub-maximal exercise decreases, because of the increased stroke volume of the heart.

Oxygen consumption (VO_2) tends to decrease Mainly as a result of the body's improved biomechanical efficiency.

Increased oxygen extraction by muscles As a result of increased growth of capillaries within muscles, thus increasing the capillary density, increased myoglobin content, and overall increased oxidative capacity.

continued....

Explain why at a certain sub-maximal workload cardiac output before and after training remains fairly constant.

performing the same workload; cardiac output dependent on workload

c The following effects are evident during maximal exercise

Maximum oxygen consumption (VO_2 max) increases As a result of increased maximal cardiac output and the improved oxygen extraction by working muscles.

Maximal heart rate decreases It is often difficult for highly trained endurance athletes to increase their heart rates above 180 beats per minute, mainly as a result of the increased stroke volume.

Why should an improved delivery of oxygen to the muscles lead to improved performance in aerobic/endurance-type activities?

Oxygen required for aerobic release of energy during endurance activities

Part 12 Teaching Resource

‘Physical Education – Just Sport that we do in School?’

Lesson Observation Sheet

National Curriculum Objective	Yes/No	Description of Activity
Developing physical skill		
Physical development		
Develop knowledge of the body in action		
Opportunities to be creative		
Opportunities to be competitive		
Team/group work		
Promote active and healthy lifestyles		
Plan actions for self/others		
Perform actions		
Evaluate to improve self or others		

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Part 13 Teaching Resource

‘Physical Education only the business of schools?’

General Considerations & Objectives

1 To understand the range of government and quasi-government policies influencing school physical education and extra-curricular sport programmes.

2 To be aware of the external bodies influencing school PE and extra-curricular sport programmes.

3 To understand the nature of school sport programmes and differences between school and club provision.

Teaching Strategy

Students need to gain a sense of the somewhat conflicting messages that are given to schools from educational and sporting bodies. The educationalists, as embodied by the Qualifications and Curriculum Authority and BAALPE are clear about the educational focus and objectives of school physical education. Other government agencies and politicians are less clear about the distinction between sport and physical education and view school sport as being the panacea for a range of educational and social ills. The Sports Council are keen to support participation but can also see schools as a nursery for elite talent, or at least in ensuring they get into clubs and talent development programmes. The Youth Sports Trust attempts to hold a middle ground in this respect.

External Influences upon Schools

QCA

Youth Sport Trust

Sport England

DfEE

Local Authorities and Government

Society's Expectations

Playing the game could be optional

Guardian 12/5/1999

Memories of being humiliated on a weekly basis during school sports lessons could become a thing of the past.

Labour Party conference 2000

Up to £1bn is to be spent on new sports facilities at schools acrosss the country as the government attempts to lift sporting standards throughout Britain.

Sports chiefs blame cuts in PE for dearth of potential Beckhams

Observer 27/2/2000

Children as young as five are becoming couch potatoes who lack even the most basic sporting skills because physical education is disappearing from school timetables.

Eton allows lower class in to play game

Public schools set to share their sport fields. Using sport to break down 'huge social barriers', revive maintained schools' interest in physical activity and halt the alarming slump in fitness levels among teenagers.

PE or not PE, that is the question

Guardian 3/3/2000

Sport England's concern is that the parlous state of the State system will lead to a return to pre-war domination of sport by the upper middle classes.

Bridging Britain's social divide

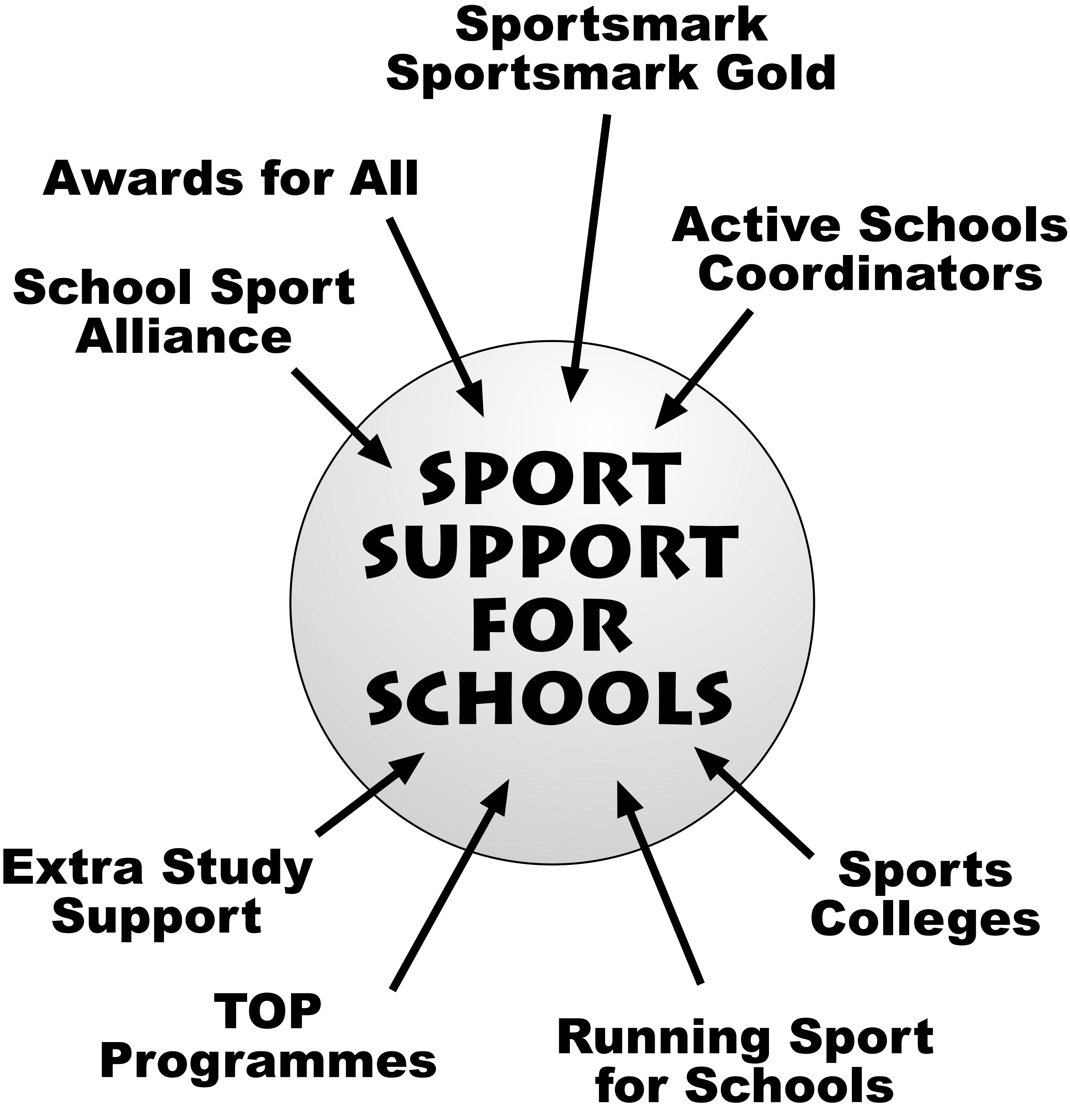
Guardian 1/4/2000

Urban renewal: Multibillion-pound deal to tackle high crime, death rates and unemployment

Lottery money

Guardian 21/6/1999

Lottery money will finance the regeneration of school sports facilities and bankroll the provision of 600 new Active Schools Coordinators.

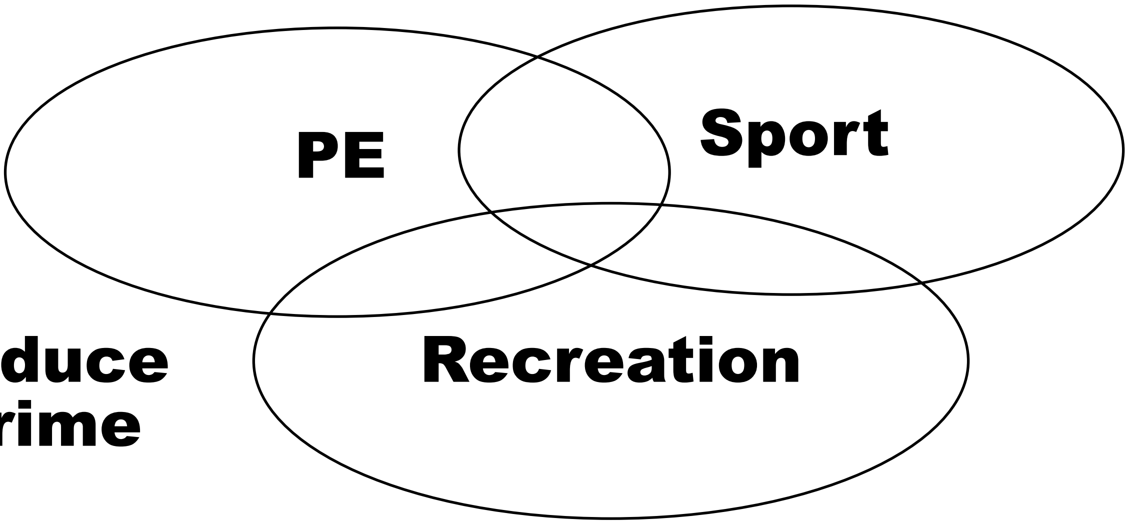

Sportsmark
Sportsmark Gold
Awards for All
Active Schools Coordinators
School Sport Alliance
SPORT SUPPORT FOR SCHOOLS
Extra Study Support
Sports Colleges
TOP Programmes
Running Sport for Schools

Produce Elite Performers

Promote the School

Counter Effects of Social Deprivation

Improve Health and Fitness



Reduce Crime

Develop School Ethos

Provide Worthwhile Activity for the Young

THE EXPECTATIONS OF THE SCHOOL ACTIVITY EXPERIENCE

k

Part 14 Teaching Resource Pack

‘Public Schools – Early Beginning and Lasting Influences’

General Considerations & Objectives

Learning Objectives

What the students are expected to learn

To help students understand that the development of rational games within the 19th Century Public Schools provides a fundamental building block to an understanding of the modern day physical education and sport scene. Four areas of knowledge may be identified:

1. To understand the stages of development of rational games in the Public Schools in the 19th Century.

2. To understand those developments in the context of social control, athleticism and the influences of evangelical Christianity.

3. To understand the influence that the Public Schools had on the development of rational recreation in wider society.

4. To examine the influence these developments may still be having on modern day sport & physical education.

Teaching Strategy

1. Students need to gain an understanding of the flow of developments both as a chronological flow and as a result of social pressures from both within the school and in wider society. The wider social pressures must include an understanding of the development of athleticism from the basis of a growing evangelical Christian influence on the idle classes.
2. It is also important that students recognise the lasting influence of these developments. They will be alluded to as the more historical study packs are used but for this pack students need to reflect on what remains in our modern day scene from the developments of Athleticism.
3. Students must engage in a range of reading for this study pack. The standard textbooks will normally suffice but those with a particular interest should be encouraged to use the extension texts.
4. The use of extracts from Tom Brown's Schooldays, both the video and the text can enliven the study of this topic area but it must be remembered that they both give rather a 'rose tinted' view of the period.
5. Rugby School has been used as an exemplar through this unit as it is often familiar to students and there is a reasonable amount of material available to support learning. It should be remembered that similar developments were taking place at other schools, some earlier than at Rugby.
6. Examination questions will tend to focus on processes and influences using examples to illustrate a point. They will not require a detailed knowledge of any particular school or activity/game/sport. General differences between the mob and rational version of games, and the greater value put on team rather than individual activities.
7. Students should also be aware of the later development of rational recreation and games in the girls schools and the different approach that was taken.
8. A range of resources are supplied for the teacher. These include summary sheets, spray diagrams, student response sheets. Enlarged time line sheets are also given to be used as a group activity on the floor.

Mob Basketball

This activity is designed to replicate the mob games as might have been played by the boys at an English public school in the early part of the 19th Century – without the physical danger. Depending upon numbers/facilities etc teachers should vary the activity to suit their needs.

Objective To get a basketball to hit a netball stand (or equivalent)

Conditions

- The game must be played on grass.
- No pitch boundaries are required.
- The ball may be carried, bounced and thrown.
- Players must wear a rugby tag in their waistband. Any defender may attempt to take the tag of a player in possession of the ball. When this occurs the player with the ball must throw the ball to a teammate immediately.
- The game is entirely non-contact.
- A goal is scored when the netball stand has been hit.
- After a goal the non-scoring team gain possession of the ball near to their stand.
- Play the game to an agreed time limit.
- Play the game without direct involvement of an official but have one observer who is noting any rule infringements and who has the authority to change the result after the game has finished if there have been any rule infringements that have influenced the outcome of the game.

After the game fill out the questionnaire.

Mob Basketball
Questionnaire

1 Did you understand the objective of the game and the rules governing play. Were there any rules you did not understand?

2 Were you able to keep to the rules. Were there any rules that were frequently broken by yourself or other players?

3 What effect did the observer and their power to alter an outcome have on the game?

4 Did any player affect the outcome of the game other than by their play?

5 Imagine this game played by 50 to a 100 people. What would happen – would rules be broken more frequently, would physical contact/violence occur, would the ball reach the objective more or less frequently.

Athleticism & Public Schools
Revision & Summary Sheet

Types of School - Public, Private, Voluntary, Board (Boarding)

Boys	Girls
Pre 1850 - Gentry, Clarendon, Barbarian (academic)	Pre 1850 - Ladies Academies
1850's - M. Class proprietary, Philistine (physical)	1850's - Ladies College Proprietary
1870's - Monastic, Cathedral, Kings	1880's M. Class, Denominational, High Schools
1880's - Denominational, Secular, Free, Grammer Schools	1900's - Secular, Free, Grammar Schools,

Development Stages 1790 - 1828

School expansion stage
Social control by boys
Popular values brought from home
Mob games and field sports, cricket

Development Stages 1828 - 1842

Arnoldian stage - school loyalty
Social control by sixth
Christian Gentlemen - Tractarian
Regular internal - rowing and games

Development Stages 1840 - 1864

Athletism - loyalty to ethic
Character development
Inter-school rowing athletics, games
Muscular Christian
Effect on society
Blues - excellence, Facilities

Games Timeline

Mob

Regularisation

Intra-school codification

Stringent administration

Inter-school competition

Social Control

Boys - Boys
Prefects - Fags
Head - Sixth Form
Housemasters - Sixth - Boys
Staff - Boys
Professional Instructors

Character Building Ethic

Physical - Endeavour, Strength, Health

Psychological - Courage, Pluck, Leader,Manly Virtues

Ethical - Moral Integrity, Cohesion, Socialisation

Girls Athleticism

Cheltenham Ladies College

Alice Ottley High

Attitudes

Head - Not keen on aggressive games

Girls - Wanted, brothers, independent

Provision

Tennis, Cricket, Hockey, Swimming, Callisthenics

Social Impact

Players

Administrators

Patrons

The Development of Games at an English Public School

Word List for use with ‘The development of Games at an English Public School

- violent
- violence
- uncivilised
- Thomas Arnold
- team
- survival
- strength
- sporting
- skills
- sixth formers
- Sixth Form
- ruthlessness
- responsibility
- prefect
- physical
- passing
- nineteenth
- ‘muscular’
- moral
- Mob football
- less
- integrity
- handling
- H-shaped
- gambling
- fittest’
- field
- endeavour
- dress
- authority
- Arnold’s
- Laws
- games
- cult

At the turn nineteenth century public schools were

uncivilised

places with much drinking, gambling and

bullying .

Headmasters attempted to rule like absolute monarchs. Outside the classroom the schools were run by the

sixth form ,

who were jealous of their various customary rights.

Mob fooball

and other sports were part of the school culture, and reflected the

violence

of this world.

As the century progressed pressure grew for the reform of the public schools. Rugby school was the first to achieve this under

Thomas Arnold

(1828-1842). He was a strong Christian and was concerned to produce Christian

Gentlemen .

who believed in godliness, piety, and a moral high and ethical social code. He was reputed not be a great enthusiast for sports generally but saw them as a means to an end He established his authority and moderated the tyranny of the older boys by reforming the

prefect

system. He expected that

responsibility

would accompany authority. He also banned

field

sports (hunting, fishing etc) and encouraged

team games.

continued....

Word List for use with 'The development of Games at an English Public School

violent
violence
uncivilised
Thomas Arnold
team
"survival
strength
sporting
skills
sixth formers
Sixth Form
ruthlessness
responsibility
prefect
physical
passing
nineteenth
'muscular'
moral
Mob football
less
integrity
handling
H-shaped
gambling
fittest'
field
endeavour
dress
authority
Arnold's Laws
games
cult

During
Arnold's
reign Rugby Football developed rapidly. The distinctive aspects of
H-shaped
goals and an emphasis on
handling
the ball had emerged by the 1840s. Around the same time boys began to wear distinctive
dress
to play the game. In 1845 a group of sixth formers wrote down 'The
Laws'
of Football as Played at Rugby School'. Over time the game became less
violent .
Success came to depend more on
skills such as
passing
and running and less on
strength and
ruthlessness . As the
nineteenth
century went on the intellectual climate changed. 'Athleticism', which stressed a combination of
moral integrity and
physical endeavour ,
became accepted as the male ideal. Popular understanding of Darwin and Spencer stressed
'survival of the
fittest' . Evangelical
'muscular'
Christianity became influential. All of this encouraged public schools to stress
sporting
prowess above all. This is what has been called the
games cult .

Time Line
Resource Sheet

To help the students develop their time line the following phrases may be given to them. It is also important that students understand the time period in which these changes and developments are occurring. Dates are not required but students should be able to identify whether a development occurs in the 'mid 19th, ' 'late 19th', 'second half of the 1800s' etc. It is useful to give the students the date of Arnold's arrival at Rugby School (1828) as a fixed point and then encourage them to think of pre-Arnold and post Arnold.

'Game Conduct' to be underpinned by Moral/Ethical Social Rules based on a Christian Foundation

Development of Inter-School Matches

Development of Internal School Sport Rules/Laws

Development of Loyalty to the House

Development of Facilities

The Playing of Mob Football and Field Sports

Banning of Field Sports

Acceptance of Common Rules Between Schools and Visiting Teams

Status and Authority given to Sixth Form

Development of Intra-School house matches etc

Development of Skills through Coaching by Professionals or 'Blues'

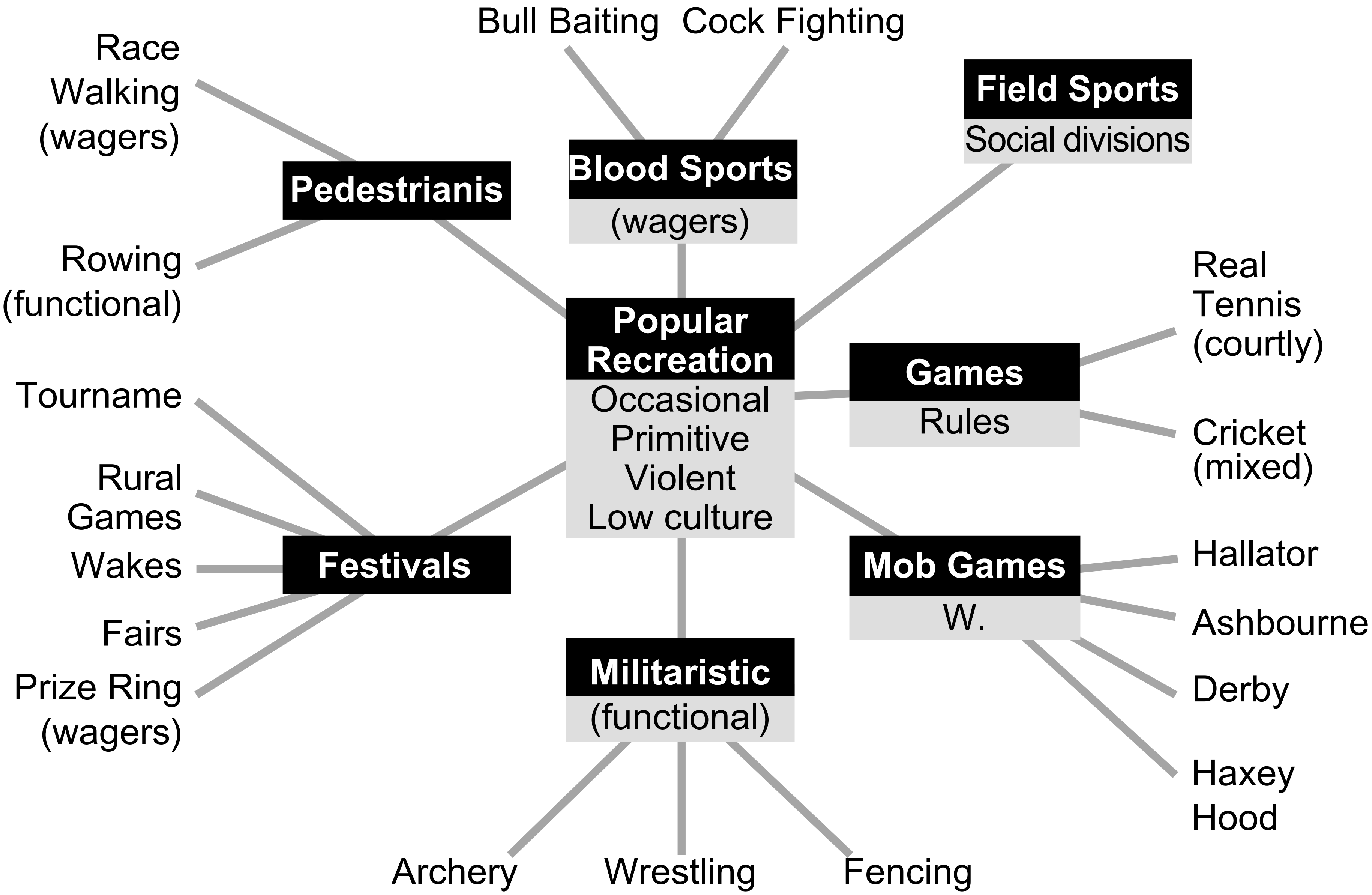
Arnold arrives at Rugby School

Time Line
Resource Sheet

Development of rational games and athleticism in the 19th Century Public Schools

Development	Time Period

Popular Recreation - Activities and Characteristics



- **Popular Recreation**
  Occasional
  Primitive
  Violent
  Low culture
  - **Pedestrianis**
    - Race Walking (wagers)
    - Rowing (functional)
  - **Blood Sports**
    (wagers)
    - Bull Baiting
    - Cock Fighting
  - **Field Sports**
    Social divisions
  - **Games**
    Rules
    - Real Tennis (courtly)
    - Cricket (mixed)
  - **Mob Games**
    W.
    - Hallator
    - Ashbourne
    - Derby
    - Haxey Hood
  - **Militaristic**
    (functional)
    - Archery
    - Wrestling
    - Fencing
  - **Festivals**
    - Tourname
    - Rural Games
    - Wakes
    - Fairs
    - Prize Ring (wagers)

Extending from Roman Times to 1800’s. Still some surviving aspects - but rationalised, civilised. Very localised.

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Comparison of values

Comparison of values and characteristics of Athleticism and the 'games cult' of the 19th Century Public Schools and the modern day PE National Curriculum and school sport

Athleticism	National Curriculum
Physical endeavour - developing one's abilities/talents	
Moral integrity, sportsmanship	
Supporting team mates, working as a team	
Supporting the house or the School	
Respecting, obeying the captain, leader	
Courage determination	
Focus/emphasis on team games	
Developing excellence - developing & marketing the school through prowess in sport	
Striving excellence - specialist facilities, coaching, practice time etc.	
Contradictory belief that excellence is 'God given' & to be seen to striving to win is 'ungentlemanly'	

As a contrast are there any characteristics and values within the modern day curriculum or school sport that would not have been found in the late 19th century public school?

Banning
of
Field Sports

The Playing of Mob Football and Field Sports

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Development of Internal School Sport Rules/Laws

Arnold arrives at Rugby School

Development of Intra-School house matches etc

Status and Authority given to Sixth Form

Development of Inter-School Matches

Development of Facilities

Development of Loyalty to the House

Development of Skills through Coaching by Professionals or 'Blues'

Acceptance
of
Common Rules
between Schools
and
Visiting Teams

‘Game Conduct’
to be underpinned
by Moral/Ethical
Social Rules
based on a
Christian
Foundation

Part 15 Teaching Resource

‘Understanding and Learning Skill’

General Considerations & Objectives

Learning Objectives **What the students are expected to learn**

1 To allow students to understand the link ability and skill.

2 To permit students to develop knowledge of skill classification.

3 To enable students to be able to apply this acquired knowledge to the introduction to their Personal Exercise Plan and/or project/practical analysis.

4 To permit students to learn a novel skill and in doing so produce a performance curve.

Teaching Strategy

In this study pack you will find a range of tasks requiring the students to develop their understanding of ability and skill. They will need to:

- Recognise key abilities
- Identify the characteristics of skilled performance
- Classify and justify their classification for a variety of skills
- Understand that there are a variety of terms used to distinguish different types of skill
- Identify the main parts of a performance curve

The tasks may be approached in isolation, or preferably following an introduction in the classroom and practical experience of skilled performance in the gym/sports hall.

The student's work could simply be assessed as answers to questions, or it may be assessed as part of a groups work, or through class discussion. The classification of skills is an important consideration in the analysis of performance that forms part of the coursework.

Be prepared to answer questions and to make suggestions.

A list is provided of a number of suitable textbooks. Your centre may also have suitable posters, videos that will help. Always remember that the teacher is ultimately the best resource. Independent learning does not mean don't ask me!

Skill - A Definition

‘the learned ability to bring about pre-determined results with maximum certainty, often with the minimum outlay of time or energy or both’
(Knapp 1963)

Four Main Features of Skill

- An outcome, objective, end product, ‘environmental goal’ (goal directed)
- Maximum results with minimum (intentional) effort (not just luck)
- Learned through practice
- High quality of performance in terms of appearance (looks good - fluent, aesthetic)

Three Components of a Skilled Performance

- Being able to appreciate what is happening -**Perception skills** - making sense of all the information coming from the senses to the brain
- Making decisions about what to do and about what’s happening - **Cognitive Skills** - concerned with thinking, planning and making decisions.
- Doing something about what’s happening - **Motor Skills** - those involved in making movements

In other words there are actually three distinct types of skill and there are three stages to performing a skill; **perception, cognition** and **action**.

Skill

Learned

Efficient

Aesthetic

Fluent

Goal Directed

Economic

A skilled movement is one in which a pre-determined objective is accomplished with maximum efficiency and with minimum outlay of energy

Motor abilities are innate inherited traits that determine an individuals coordination, balance, ability and speed of reactions.

Gross motor abilities

Strength - static, dynamic, explosive

Extent and dynamic flexibility

Stamina

Trunk strength

Gross body coordination and equilibrium

Psychomotor abilities

Static and dynamic balance

Limb coordination

Control precision

Arm movement speed

Visual tracking

Reaction time

Eye-hand/foot coordination

Manual dexterity

Response orientation

Finger dexterity

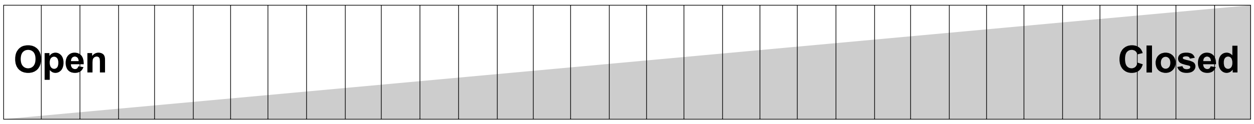
Skill Classification

Observe performances in a variety of situations related to your chosen activities within the practical coursework. For each of the observed situations describe/name the skill and describe the situation in which it took place. Then identify where on each of the continua the skill should be placed.

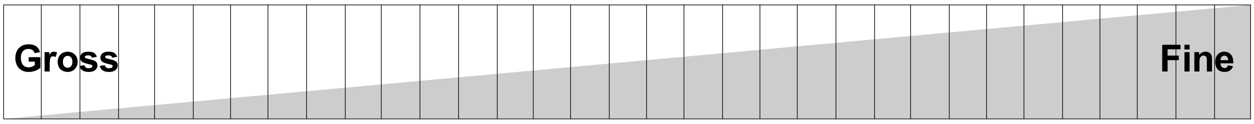
Observed Skill ________________________________

Performance Situation ________________________________

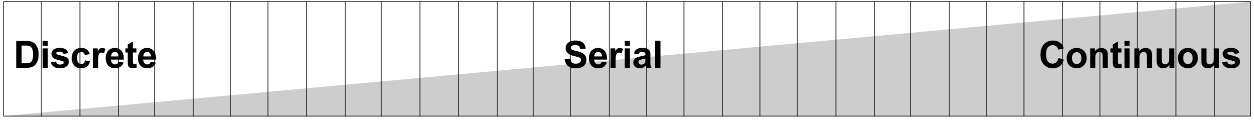
Environmental Influences


Open
Closed

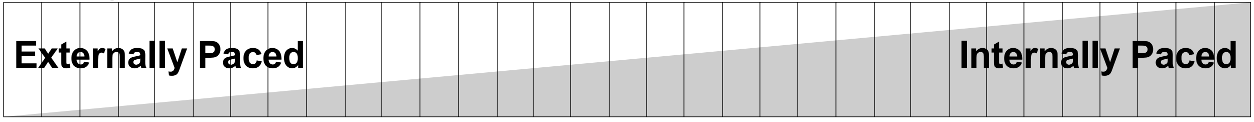
Muscular Involvement



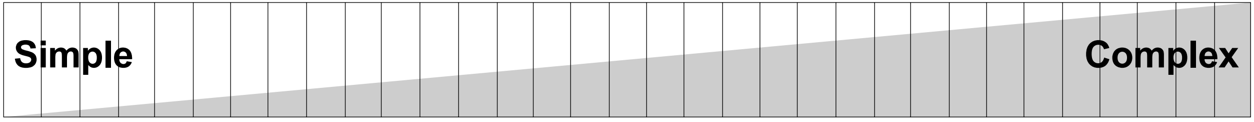
Continuity


Discrete
Serial
Continuous

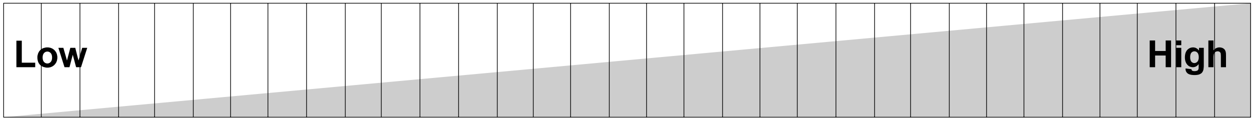
Pacing


Externally Paced
Internally Paced

Difficulty


Simple
Complex

Organisation

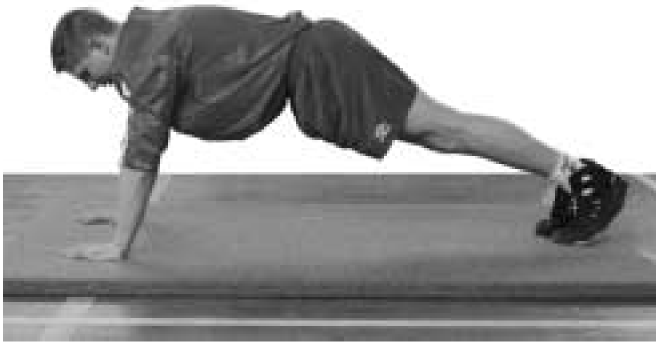


Skill Classification

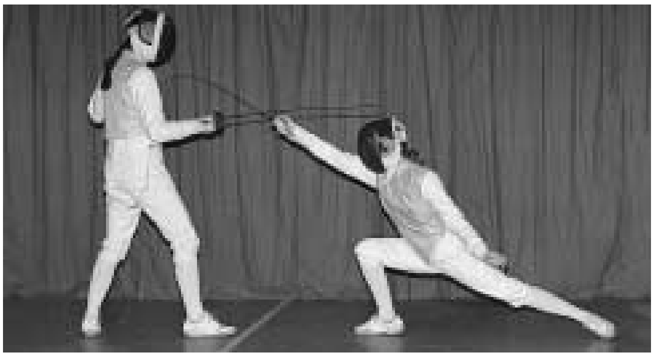
Externally Paced

Internally Paced

Simple



Complex

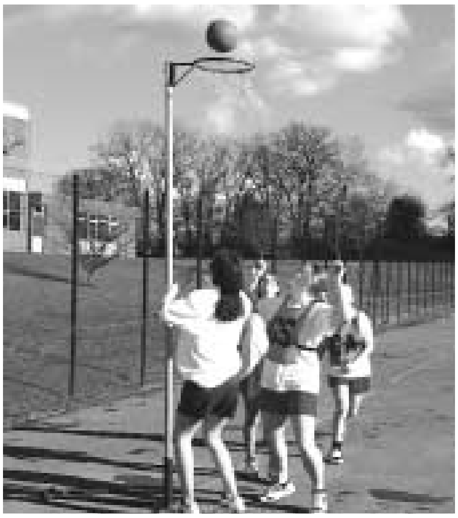


Low Organisation

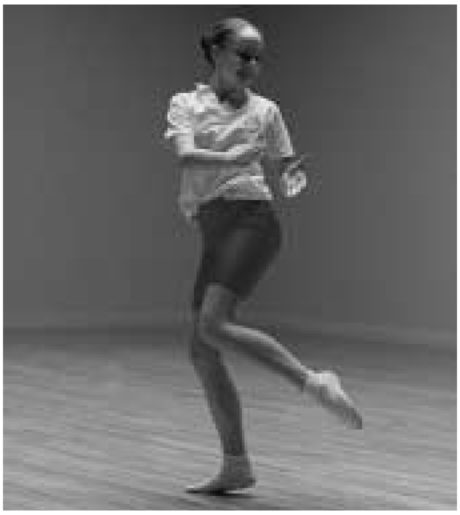
High Organisation

Skill Classification

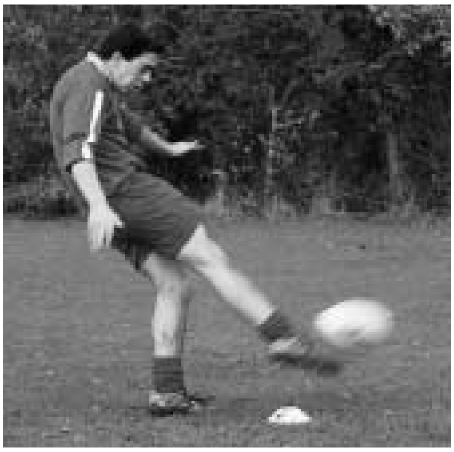
Open



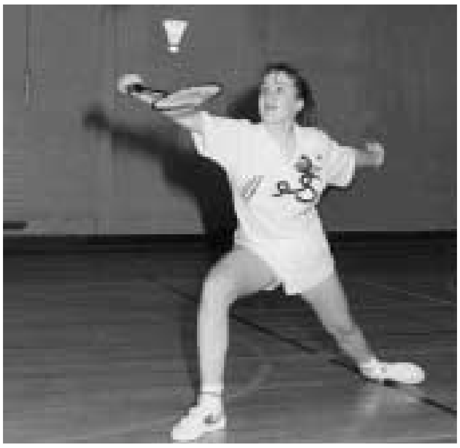
Closed



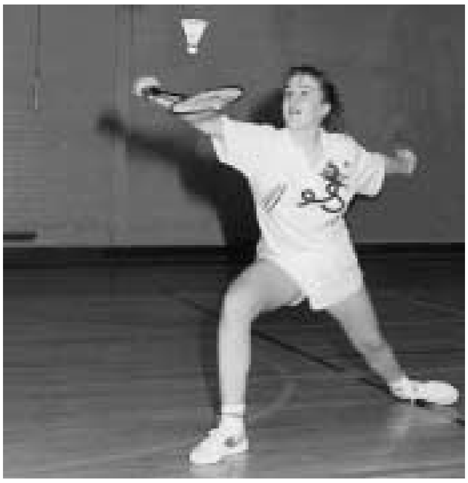
Gross



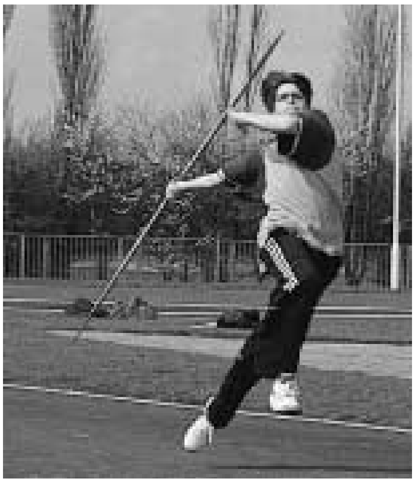
Fine



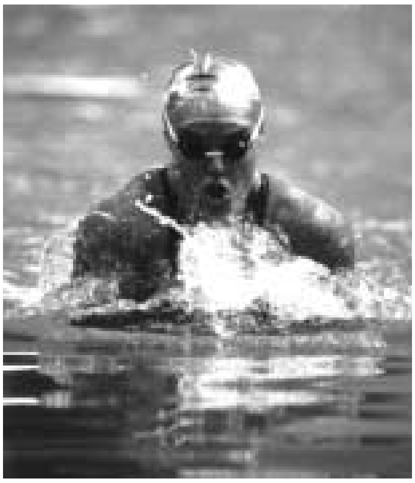
Discrete (one shot)



Serial



Continuous



Task 1 Abilities and skills

a Think of three different sports and for each, identify the key abilities required by a skilled performer at that sport.

Activity	Ability Required	Ability Required	Ability Required

Depends on skill chosen, but should include perceptual-motor abilities such as co-ordination, response orientation, reaction time, finger dexterity, aiming, etc. as well as physical abilities such as strength, flexibility, equilibrium, limb speed, stamina.

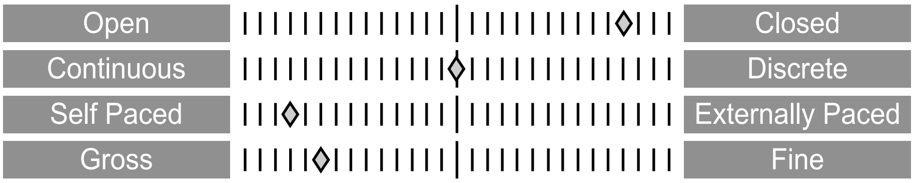
b Knapp defined skill as - ‘The learned ability to bring about predetermined results with maximum certainty, often with the minimum outlay of time or energy or both.

Use this definition to suggest the main characteristics of a skilled performance.

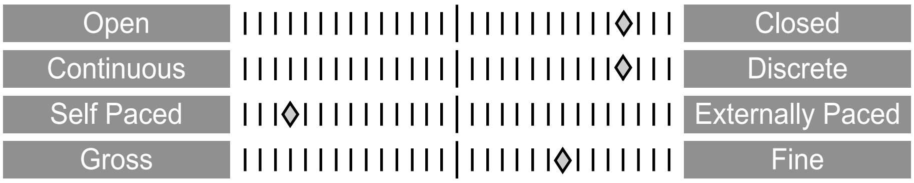
Skills are learned; skills have some end-point/environmental goal; this goal is achieved with some degree of consistency; skilled performance involves the minimization of energy or time or both

c Classify the following skills, by marking the continua in the appropriate place, as either open/closed, self-paced/externally-paced, continuous/discrete, and gross/fine.

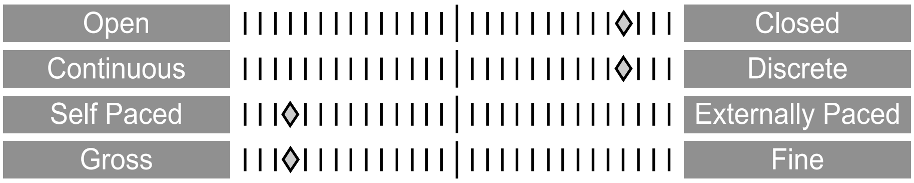
Gymnastics Tumble


Open
Closed
Continuous
Discrete
Self Paced
Externally Paced
Gross
Fine

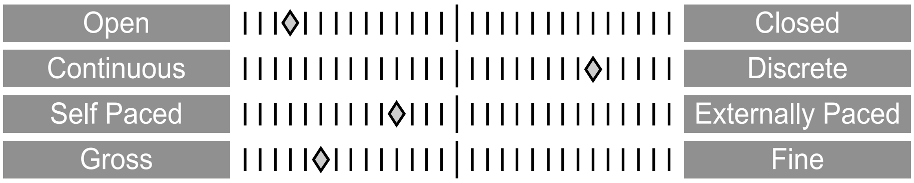
Archery


Open
Closed
Continuous
Discrete
Self Paced
Externally Paced
Gross
Fine

Long Jump


Open
Closed
Continuous
Discrete
Self Paced
Externally Paced
Gross
Fine

Soccer Dribble


Open
Closed
Continuous
Discrete
Self Paced
Externally Paced
Gross
Fine

d Justify your placements for the soccer dribble.

Open because the environment is continually changing and therefore decisions have to be made as to what to do. Continuous because the same skill component is repeated over and over again/discrete because there is a distinct beginning end – either justifies the answer.

Self-paced because the performer decides when to begin the skill or externally-paced because other players force the decision about when to begin the skill – either answer justifies itself.

Gross because it involves large leg muscles.

e Refer back to your answers to question d, and for each answer you have given, suggest

a situation that would cause the position of the skill on the continuum to change.

Open/closed could change because the dribble is well-rehearsed and becomes the performers usual and only way of beating an opponent.

Continuous/discrete could change because the skill could involve the performer repeating the same move over and over again, or it could become discrete if the performer demonstrates a clear beginning and end to a single skill.

Self-paced/externally-paced because the performer has the performance of the skill dictated to them by the opposition's positions, or become self-paced if the opposition/team mates are having no effect on performance.

Gross/fine could change because slight movements are under fine control, whereas whole body movements are under gross control.

Task 2 Performing and Analysing Skills – a summary

Skill – a definition

‘the learned ability to bring about pre-determined results with maximum certainty, often with the minimum outlay of time or energy or both’ (Knapp 1963)

a Using the above definition, identify the four main characteristics or features of skilled performance.

1 An outcome, objective, end product, ‘environmental goal’

2 Learned through practice.

3 Maximum results with minimum (intentional) effort (not just luck)

4 High quality of performance in terms of appearance (looks good)

b Summarise skilled performance by completing the diagram below.

Four Main Features of Skill:

An outcome, objective, end product, 'environmental goal'

Learned through practice

Maximum results with minimum (intentional) effort (not just luck)

High quality of performance in terms of appearance (looks good)

c Skilled performance essentially involves three main components, perceptual, cognitive and motor skills. Explain what each of these terms mean.

Perceptual skills – making sense of all the information coming from the senses to the brain

Cognitive skills – concerned with thinking, planning and making decisions

Motor skills – those involved in making movements

d Summarise skilled performance by completing the diagram below

Three Components of a Skilled Performance:

Being able to appreciate what's happening - Perceptual skills - making sense of all the information coming from the senses to the brain

Making decisions about what to do and about what's happening - Cognitive skills - concerned with thinking, planning and making decisions

Doing something about what's happening - Motor skills - those involved in making movements

In other words there are actually three distinct types of skill and there are three stages to performing a skill; perception, cognition and action.

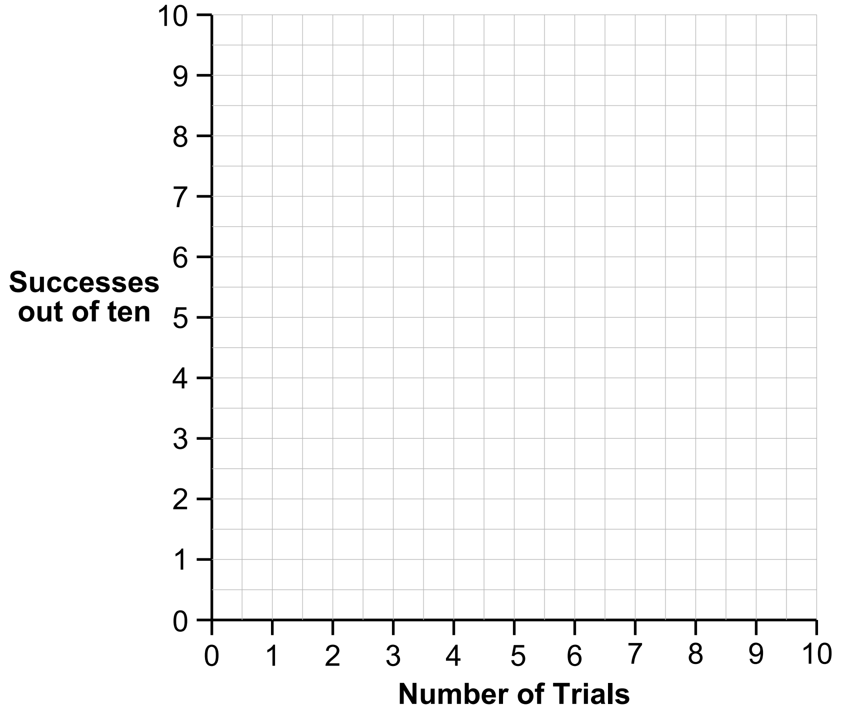
Task 3 Learning and performance

a You are going to learn a new skill. The skill involves using one hand (your dominant hand) to throw a quoit (rubber ring) into the air, and whilst the ring is in the air, use the same hand to pick up an athletics relay baton and then capture the quoit by passing the baton through the centre of the quoit. A successful attempt thus finishes with the baton through the quoit.

You are allowed ten attempts. Work in pairs, with your partner recording the number of successes and failures. Change roles. Repeat the 10 attempts ten times (10 sets of 10 attempts), and record your own results in the following table.

Attempt Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Number of Successes										

Draw your results on the following graph:



What you have drawn is a learning curve.

Part 16 Teaching Resource

‘Making decisions’

General Considerations & Objectives

Teaching Objectives

What the students are expected to learn

1. To allow students to understand the complexity of the decision-making process.
2. To permit students to develop knowledge of the variety of stimuli reaching the body.
3. To demonstrate to students the roles of the perceptual mechanisms and selective attention
4. To permit students to learn about and discriminate between the different memory stores, and to understand the duality of their roles.
5. To allow students to discover the components of response time and to distinguish simple and choice reaction time.
6. To develop an understanding of the psychological refractory period

Tasks

What students are expected to do

In this study pack you will find a range of tasks requiring the students to develop their understanding of information processing. They will need to:

- ▼ Develop an overview of the processes involved
- ▼ Identify the various sensory stimuli involved
- ▼ Understand the concepts of perception and selective attention
- ▼ Clarify the roles of the different aspects of memory

Establish the time-base under which many sports are played and hence develop an understanding of reaction time and the psychological refractory period

The tasks may be approached in isolation, or preferably following an introduction in the classroom and practical experience of the processes involved in the gym/sports hall.

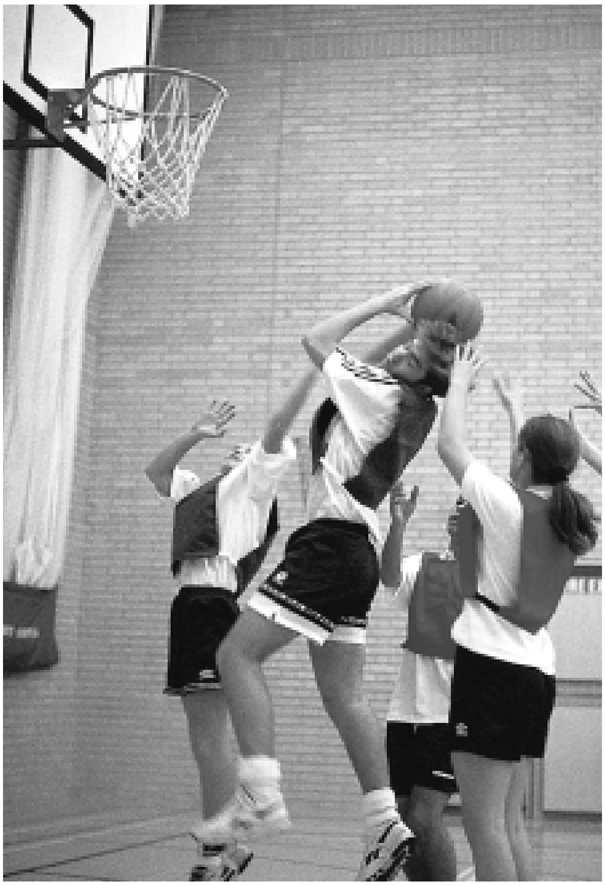
The student's work could simply be assessed as answers to questions, or it may be assessed as part of a groups work, or through class discussion. The aspects of information processing is an important consideration in the analysis of performance that forms part of the coursework.

Be prepared to answer questions and to make suggestions.

A list is provided of a number of suitable textbooks. Your centre may also have suitable posters, videos that will help. Always remember that the teacher is ultimately the best resource. Independent learning does not mean don't ask me!

Task 1 Central Processing

Study the following picture



a The basketball player in possession of the ball is surrounded by a massive variety of information or stimuli, only some of which can be detected by his sense organs. Suggest the type of information that might be being received by the various sense organs of this player.

visual – own and others location

auditory –

calls of team mates, opponents, officials; crowd noise

kinaesthetic – limb position…

tactile – feel ball, floor

Proprioceptive – balance

taste, smell also possible

b The first aspect of the central processing system is that of perception. Where only relevant material is selected for further processing. This selection procedure involves not only determining what is currently happening, but also what is about to happen in the near future. Make a list of the relevant information that the basketball guard needs to attend to.

Visual cues about location and posture of defenders and attackers; the movements of defenders and attackers; their position on court, especially in relation to the basket; the heights and agilities of the players. Internal cues concerning the players own posture and balance; the tactile sensations of the ball and flooring; the auditory sensations of the players and crowd.

c The next stage in central processing is the decision-making process (response selection), which involves determining what actions or responses are required (picking the correct option). In the situation illustrated, the guard has a number of possible options. List the three different options that he has.

1 Continue dribbling

2 Pass

3 Shoot

Deciding which option to select depends not only on the perceptual information being received, but on other information such as the state of the game, the player's abilities and knowledge of his team mate's and the opposition's capabilities.

d Once selected, the desired action must be organized before it can be initiated. What does this organization involve?

Sending motor commands from brain that specify the sequence and timing of the recruitment of the correct number and size of motor units

Task 2 Perception

Sense Organs a Summary

There are three important sources of information (signals) for sport – vision, auditory and proprioception, as shown in the diagram below.

a Complete each box to show your understanding of the role of each sense in skilled performance.

The most important sporting sense (90% of all information). Provides information about movement of objects (ball/players/etc.) and about our own position

Auditory (ears)

Enables identification of what we cannot see (team mate calling for ball). Provides important information in certain sports - hearing racket achieve good strike on ball.

Proprioception (body awareness)

Awareness of the body's position in space, its balance, position of limbs, etc. Has three parts:

Touch - feel grip on racket/floor

Equilibrium - sense of balance

Kinaesthesis - sense telling brain about movement of muscles, tendons and joints so we 'know' where our arms are without looking!

All three senses provide feedback about movements (intrinsic feedback) so that we may adjust movements. Forms part of input in information processing model.

b Imagine you are playing in a game. You are waiting to receive a pass. Make a list of the various things (cues) that your senses have to detect, in order for you to be able to perform the skill of receiving the pass?

Visual – ball, team mates, opponents, position on field/court and position of goals/basket; auditory – sounds from team mates, opponents, crowds; kinaesthetic – position of limbs; tactile – feel stick/racket, or no sense of something in hands, also feel feet – grip, slipperiness; Proprioceptive – feel balance

c These (cues) factors are all stimuli. A stimulus is any item of information that stands out from the background (the noise). Stimuli in a game situation include things like the ball, but also include opponents, conditions, team-mates, etc.

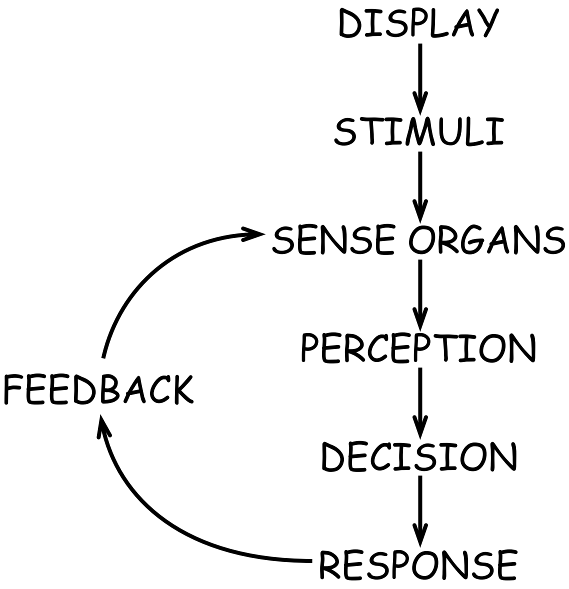
It is usually easier to sense and identify things if they are loud, bright, large, contrasting, fast-moving, or unusual.

Give examples of how this idea is used to make the playing of games easier?

Team strip/colours; contrasting ball – orange in snow/yellow tennis balls; cricket pads/ball/sightscreens

d Interpreting stimuli involves the process of perception. Rearrange the terms below to produce a CORRECT model that shows how we process the information that comes into use during a game. Use arrows to show the direction in which the information flows:

RESPONSE PERCEPTION STIMULI SENSE ORGANS DECISION DISPLAY FEEDBACK


DISPLAY
STIMULI
SENSE ORGANS
PERCEPTION
DECISION
RESPONSE
FEEDBACK

e During the perception stage, the stimulus has to be identified. This involves three elements:

Detection, Comparison and Recognition

Detection is the process of the registering of the stimulus, by the sense organ.

Comparison is the process of referring the stimulus to the memory, to compare it to previously stored stimuli.

Recognition is the process of finding a corresponding stimulus in the memory.

This is known as the **D C R process**.

Explain what is involved in the DCR process when waiting for your opponent to serve in a racket game.

Detection – stimuli – court positions, body position and actions, racket swing and grip shuttlecock flight, leave impression in brain;
Comparison – stimuli are compared to previously stored information in memory;
Recognition – stimuli are identified as being of a certain type through similarities to memory

f During a sporting activity, we will be receiving (detecting) a tremendous amount of information, the vast majority of which is largely ignored.

For example, during a game, such as basketball, we tend to be unaware of many stimuli, such as the temperature, the touch of our clothes on our skin, the noise of the crowd, buses passing outside the hall, the firmness of the ground beneath our feet, etc.

In basketball what important stimuli might be detected when defending the ball carrier?

Position of opponents, basket, co-defenders.

Position of ball carrier in relation to you.

Position of ball in carrier's hand.

Shouts from other players

g We try to be solely concerned with the activity in question, and more importantly, those aspects of the game that are directly our concern.

In the basketball game what comparison might be looked for when defending the ball carrier?

Comparison of previous experience – short term or long term of what these stimuli imply

h What can be done once you have recognised the stimuli that indicate the ball carrier is about to fake a shot and dribble to the basket?

Previous memory stores

i The vast amount of information received during a game demands that we have to learn to concentrate on the stimuli that are important. This is called **selective attention**.

Certain stimuli attract our attention better, e.g., loud, bright, fast, contrasting, unusual, but so do stimuli in which we are interested. A demonstration of an overhead clear in badminton would present much more information to somebody who had never seen it performed before, than it presents to an expert.

Thus the amount of information used in this context, is directly proportional to the amount of uncertainty an event holds for a given individual. If the situation presented to you is novel, then there is considerable information to be taken in, and you can easily suffer from information overload.

If however, you are an expert, then there is less information to be concerned about. You filter out the unnecessary junk that is part of the environment. Selective attention allows us to focus on just a few of the millions of stimuli arriving.

Why is this helpful in a game situation,?

far too many stimuli to attend to, and invariably games involve quick responses to stimuli, hence need to detect important ones quickly

j Can you use the information provided on selective attention to explain how an expert can detect information quicker than a novice, and thus appear able to play better?

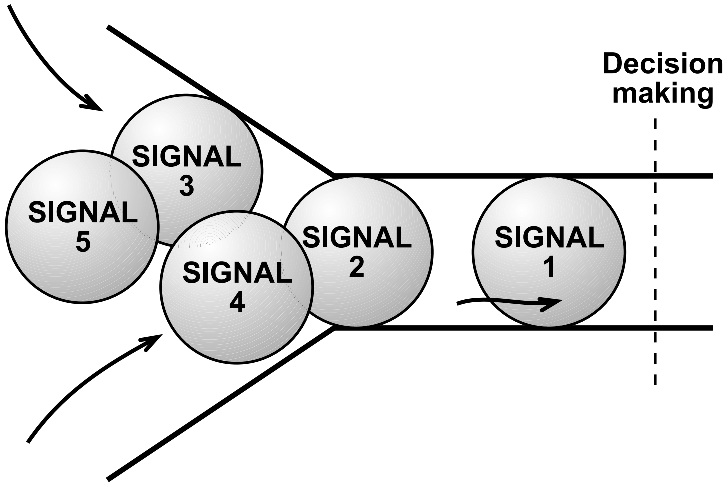
Stimulus identification improves.

The competent performer can increasingly analyse sensory patterns (e.g. the flight of a ball) automatically, and thus detect stimuli quicker and without any cognitive involvement.

The learner has to think about the flight of the ball before he/she can do anything else and this is a relatively slow process

Task 3 Decision-making

a Decision-making (translation process) can be thought of as taking place within a tube – this is known as the single channel hypothesis. It explains that until one piece of information signal has been dealt with, another cannot be acted upon. A model of this is shown below.



Decision making
SIGNAL 3
SIGNAL 5
SIGNAL 4
SIGNAL 2
SIGNAL 1

The decision-making process can become overloaded. It becomes more efficient if the tasks can be dealt with free from other matters. You must not 'clog up the system'.

Explain this process of overloading the decision-making through a practical situation.

Many possible answers, such as novice unable to selectively attend to stimuli and therefore chooses incorrect cue to respond too.

Novice faced with too much information and takes too long to pick out appropriate stimuli

b The depth/wealth of the performer's "knowledge" of the relevant signals (cues), and his/her ability to detect these cues early, influences the time spent making a decision.

As skill levels increase, outside interference to the decision-making processes is ignored. This is one reason why the skilled performer is better than the novice. The novice is trying to take in too much information at once.

Decision time is therefore improved by practice, and is speeded up through coaching, where the relevant 'cues' can be 'highlighted'.

The time spent making decisions is called reaction time. It is measured from the point at which the stimulus was given to the point where the response is initiated. It is, in reality, the time taken to process stimulus information.

Reaction time = time taken to decide response.

What factors influence reaction time?

Reaction time is to a large extent genetically determined, although it is influenced by the uncertainty of the stimulus to the performer i.e. his lack of knowledge. Reaction time is also influenced by the intensity of the stimulus (Selective attention). More practice gives more knowledge, which in turn reduces uncertainty and hence reaction time.

c Reaction time is only part of the decision-making process. The time from when a decision is made and a movement is initiated to the point to when the movement is complete is referred to as the movement time.

Movement time is determined to a large extent by the muscle-fibre type and strength, as well as the level of learning of the motor programme involved, all of which can be improved by training/practice.

Movement time = initiation of response to end of movement

The time from the stimulus being presented to the response being completed is the response time.

Response time = time from stimulus being given to the end of the response.

How are response time, reaction time and movement time related?

Response time = reaction time + movement time

d Describe response time, movement time and reaction time in a 100-metre sprint.

Reaction time =

time from stimulus (gun) to time movement is initiated;

movement time = time of movement

(initiation to completion of movement/end of race);

response time = time from stimulus (gun)

to completion of movement (end of race)

e Response time is easily measured through the falling ruler experiment. Work in pairs. One student (the investigator) holds a ruler vertically with the lower end (0 cms) in-between the fingers of the other student (the subject). The objective of the investigator is to allow the ruler to drop freely without giving subject any warning. The objective of the subject is to catch the ruler after the investigator drops it.

Each time the ruler is dropped, measure the distance the ruler falls before being caught in cms. Allow 6 attempts and discard the best and worst distances and find the mean of the other four.

Attempt No.	**Distance fallen (cms)**
1	
2	
3	
4	
5	
6	
Mean	

f Calculate response time from the average distance dropped, using the formula:

$$\text{Reaction time} = \frac{2 \times d}{10}$$

g Illustrate your understanding by identifying reaction time, response time and movement time in the ruler dropping experiment.

Response time =
time from when ruler is dropped to time when ruler is caught;

Reaction time =
time from when ruler is dropped to time when fingers begin to move;

Movement time =
time from when fingers begin to move to time when ruler is caught.

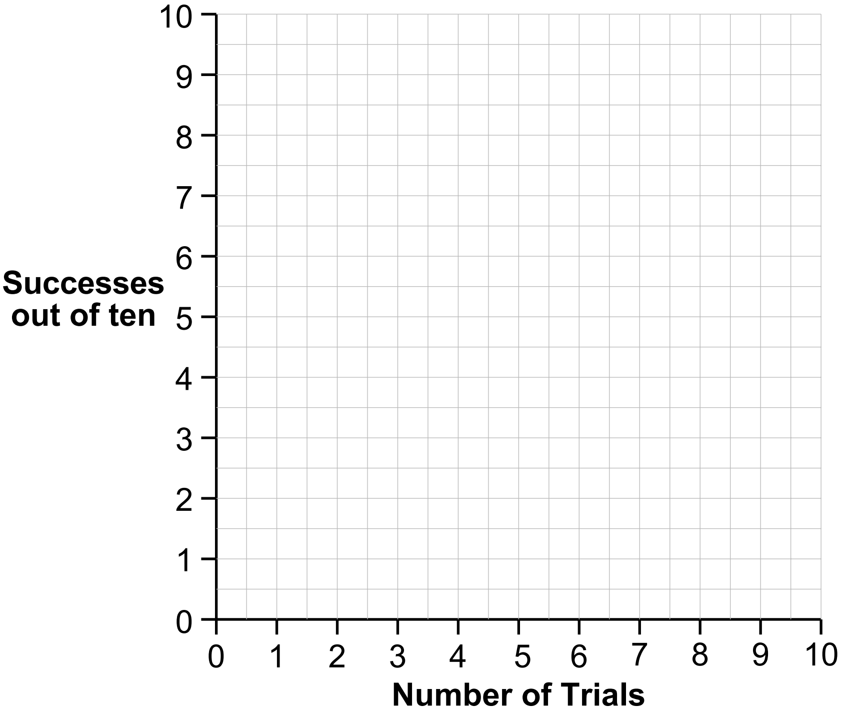
Task 3 Learning and performance

a You are going to learn a new skill. The skill involves using one hand (your dominant hand) to throw a quoit (rubber ring) into the air, and whilst the ring is in the air, use the same hand to pick up an athletics relay baton and then capture the quoit by passing the baton through the centre of the quoit. A successful attempt thus finishes with the baton through the quoit.

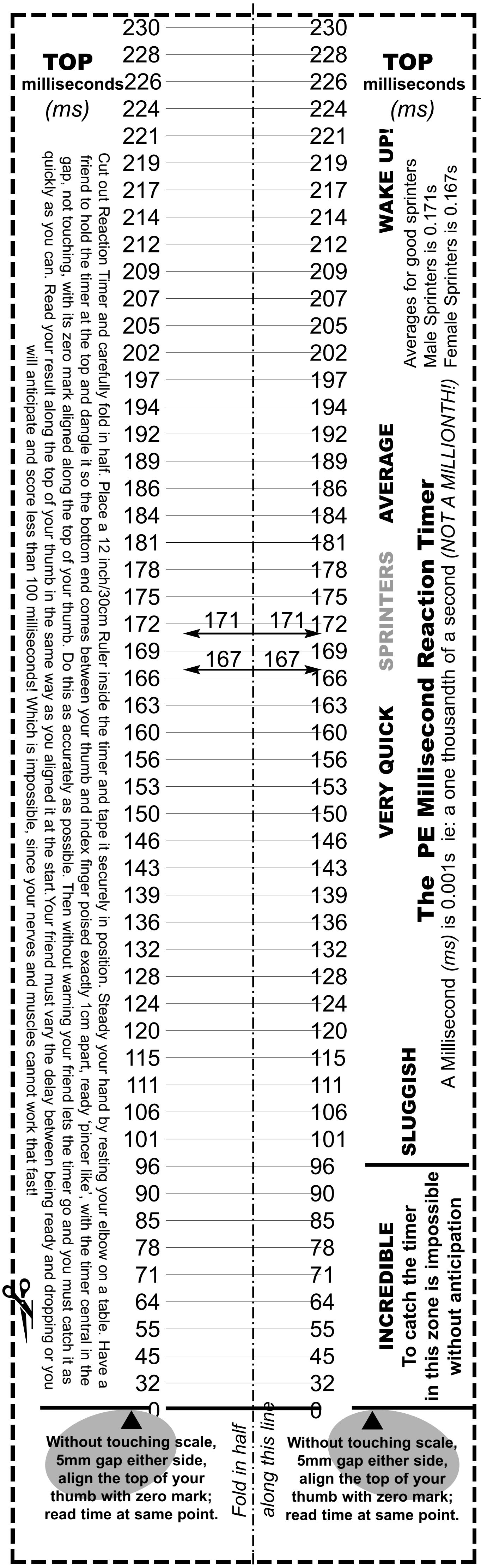
You are allowed ten attempts. Work in pairs, with your partner recording the number of successes and failures. Change roles. Repeat the 10 attempts ten times (10 sets of 10 attempts), and record your own results in the following table.

Attempt Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Number of Successes										

Draw your results on the following graph:



What you have drawn is a learning curve.


TOP
milliseconds
(ms)
230
228
226
224
221
219
217
214
212
209
207
205
202
197
194
192
189
186
184
181
178
175
172
169
166
163
160
156
153
150
146
143
139
136
132
128
124
120
115
111
106
101
96
90
85
78
71
64
55
45
32
0
171
167
WAKE UP!
AVERAGE
SPRINTERS
VERY QUICK
SLUGGISH
INCREDIBLE
Fold in half along this line

Cut out Reaction Timer and carefully fold in half. Place a 12 inch/30cm Ruler inside the timer and tape it securely in position. Steady your hand by resting your elbow on a table. Have a friend to hold the timer at the top and dangle it so the bottom end comes between your thumb and index finger poised exactly 1cm apart, ready 'pincer like', with the timer central in the gap, not touching, with its zero mark aligned along the top of your thumb. Do this as accurately as possible. Then without warning your friend lets the timer go and you must catch it as quickly as you can. Read your result along the top of your thumb in the same way as you aligned it at the start.Your friend must vary the delay between being ready and dropping or you will anticipate and score less than 100 milliseconds! Which is impossible, since your nerves and muscles cannot work that fast!

The PE Millisecond Reaction Timer

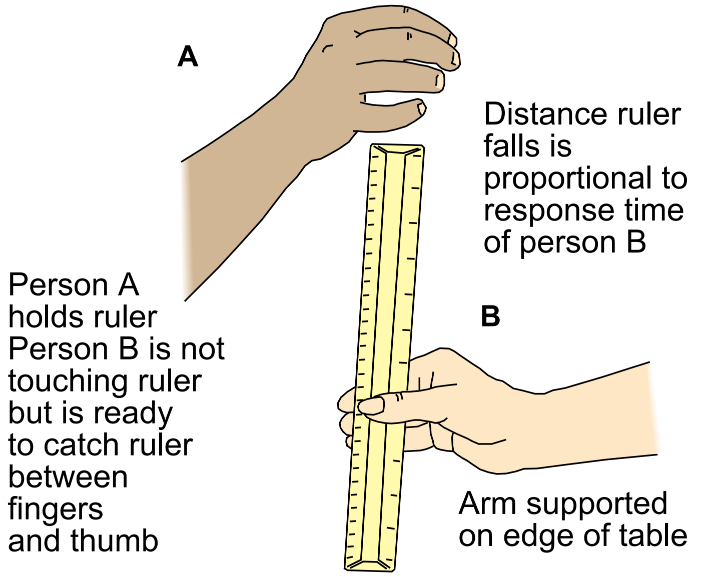
A Millisecond (*ms*) is 0.001s ie: a one thousandth of a second (*NOT A MILLIONTH!*)

Averages for good sprinters
Male Sprinters is 0.171s
Female Sprinters is 0.167s

To catch the timer in this zone is impossible without anticipation

Without touching scale, 5mm gap either side, align the top of your thumb with zero mark; read time at same point.

The illustration shows the simple dropped ruler test for speed of reaction.


A
B
Distance ruler falls is proportional to response time of person B
Person A holds ruler Person B is not touching ruler but is ready to catch ruler between fingers and thumb
Arm supported on edge of table

In the dropped ruler test the distance the ruler drops is proportional to the time passed. To help you convert the distance the ruler fell into actual time, you can use the conversion scale below or, you could make and use the timer opposite, graduated in milliseconds giving a direct reading in time.

Distance fallen by ruler in mm	**Reaction Time to nearest ms** *(0.001s)*	**Distance fallen by ruler in mm**	**Reaction Time to nearest ms** *(0.001s)*	**Distance fallen by ruler in mm**	**Reaction Time to nearest ms** *(0.001s)*
0	0	100	143	200	202
5	32	105	146	205	205
10	45	110	150	210	207
15	55	115	153	215	209
20	64	120	156	220	212
25	71	125	160	225	214
30	78	130	163	230	217
35	85	135	166	235	219
40	90	140	169	240	221
45	96	145	172	245	224
50	101	150	175	250	226
55	106	155	178	255	228
60	111	160	181	260	230
65	115	165	184	265	233
70	120	170	186	270	235
75	124	175	189	275	237
80	128	180	192	280	239
85	132	185	194	285	241
90	136	190	197	290	243
95	139	195	199	295	245

Feltham Press

h There are two reaction times, simple reaction time (SRT) and choice reaction time (CRT).

SRT is the time taken to start a response to a single stimulus e.g. the sprinter at the start of the race.

CRT is the time taken for an individual to respond correctly from a choice of several stimuli each one demanding a different response. e.g., the basketball player at the top of the key deciding whether to shoot, pass or dribble.

Which will take longer, SRT or CRT? Explain your answer?

CRT takes longer because the perception, decision-making and response selection stages require more decisions/choices to be made

i CRT is far commoner in sport. Performers have to make a choice about what to do.

Why does the skilled performer have a much quicker CRT than the novice?

The novice attempts to respond to too many stimuli, the elite performer selects only those that are appropriate. Both the novice and the elite performer then decide which of these stimuli to respond to. The novice has many different responses to choose, whilst the elite performer has perhaps only a single response to a stimulus.

j Repeat the ruler-dropping experiment, but this time the investigator holds two rulers, and the subject has to decide which ruler is falling before making a decision about which one to catch.

Attempt No.	**Distance fallen (cms)**
1	
2	
3	
4	
5	
6	
Mean	

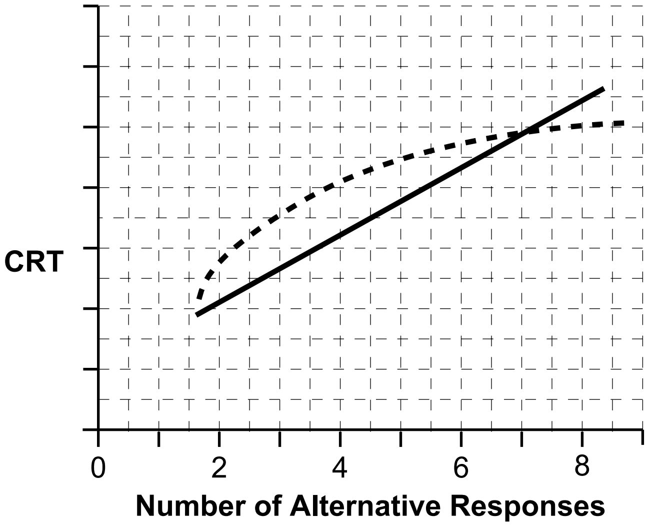
k What effect does the second ruler have on response time?

The second ruler makes response time longer

l The more choices that are available, the slower the CRT. This is Hick's Law. As the number of choices increases, so does reaction time. For example try the following card-sorting experiment. Time how long it takes your partner to sort a pack of playing cards into two groups, the red cards and the black cards. To stop any variability in the method, the subject should hold the pack face down, turn the top card over and place it in the appropriate pile. Once completed, the pack should be shuffled, and the experiment repeated, and the time taken by the subject to sort the pack into the four suits of diamonds, hearts, clubs and spades, measured. Finally the time taken to sort the re-shuffled pack into separate sets of court cards (jack, queen and king) and number cards of each suit (8 separate piles) should be measured.

Number of Stacks	**Time Taken (seconds)**
2	
4	
8	

m A graph should then be drawn of CRT and number of choices. A straight-line relationship is often seen/supposed. More accurately, the relationship is a curve as shown below



n How could a performer use their knowledge of reaction time to make it more difficult for their opponent?

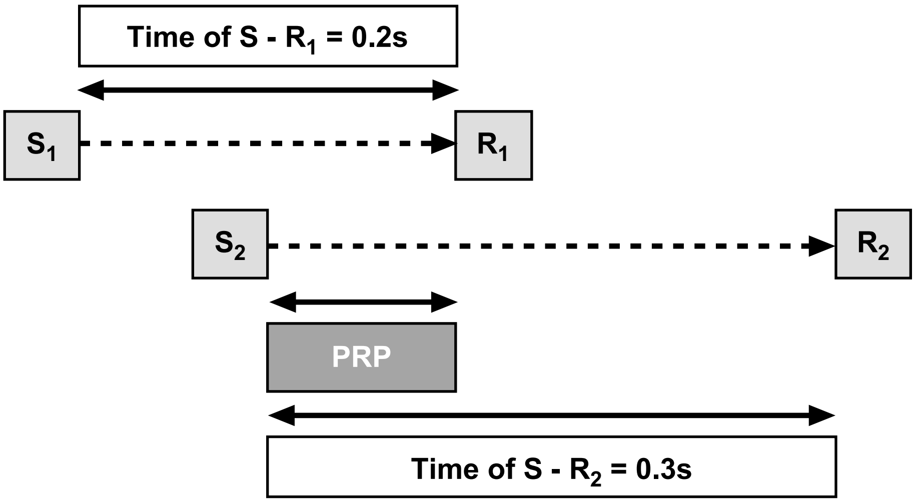
In competition the athlete should avoid making the same response, or presenting the same stimuli, all the time. This leads an opponent to treat the situation as SRT, and thus allows him to minimise the time taken to respond. Hence the athlete should try to give his opponents as wide a variety of stimuli as possible to increase their opponents CRT.

The athlete should practice to develop as wide a range of new movements as possible, so as to increase the number of possible stimulus alternatives to present to an opponent.

o Psychological Refractory Period

During the response to a stimulus, there is a short delay whilst the performer decides how to respond to the stimulus, before initiating the appropriate motor programme. During the time that this takes, the performer, because of the limited capacity of the brain to deal with the processing of information, cannot produce a response to any other stimulus. If a second stimulus is given, the reaction time is much slower than normal.

In the diagram below, S1 and S2 are two stimuli, and R1 and R2 are the times when the responses are initiated. Thus the distances S–R indicate the reaction time.



The delay between the initiation of the second stimulus and the time before the response to the first stimulus is completed is called the psychological refractory period. It serves to illustrate the single channel theory of information processing.

You can see that in the above diagram, the reaction time to the second stimulus is longer than to the first.

The principle of psychological refractory period is used in sports:

S1 where players 'sell a dummy' or 'feint' one way.

R1 defender initiates a response to the first stimulus (the dummy).

S2 attacker then goes the other way.

R2 The defender moves to the feint before they move to the actual movement, it is then too late to respond correctly.

Using the example of the shuttle hitting the net and remaining in play in badminton, explain P.R.P.

First stimulus is initial flight of shuttle, and response is made to that, but before the response can be completed, the net alters the flight of the shuttle and so a second stimulus now operates. However because of the single channel hypothesis, a response to the second stimulus cannot be initiated until the response to the original stimulus is completed, and so the second response takes longer.

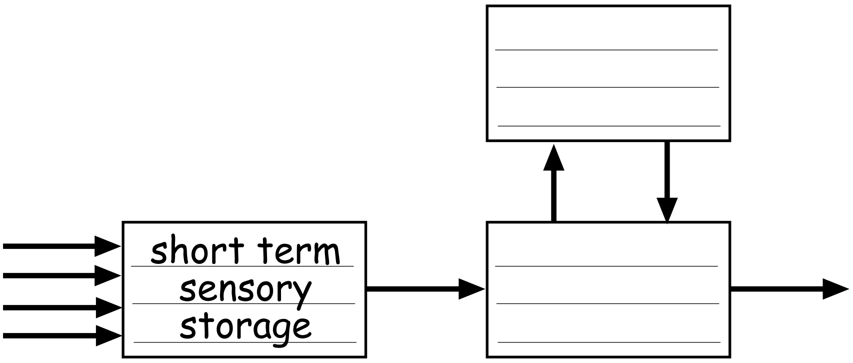
Task 4 Memory

a In sport, we do things like perceive the flight path of a ball, or know which muscles to contract in which order to be able to perform a somersault. Both these actions require that information be remembered and used, in the execution of the action.

There are three aspects to memory:

STSS Short-Term Sensory Storage (STSS) - all the information coming in from the environment can be stored in the STSS. This lasts about half a second or less. It is the first 'compartment' of memory. Separate STSS compartments are thought to operate for each form of sensory information. It is sub-conscious, and if not immediately attended to, is lost.

Illustrate the location of the Short-term Sensory Storage within the following Information Processing model.



b Explain why the above model has 4 arrows entering from the left but only one arrow continuing.

selective attention; many stimuli from display, limited information attended to

STM Short-term Memory (STM) - Only information that is attended to, is moved from STSS to STM. It is important in sport, that attention is maintained whilst performing a skill, e.g., keep your eye on the ball until you have caught it before attending to the next skill of moving

The capacity of the STM is limited. Information can be retained for up to 60 secs, but the capacity is limited to 5-9 items. 'Chunking' helps.

Information remains in the STM only as long as it is attended to, e.g., by rehearsal. If attention is directed elsewhere, information is lost within 30 secs.

STM is important in learning motor skills. You need to recall information about a performance, to compare it to previous performances.

Hence, all the information involved in the learning and performing of skills is compared to existing information via the STM, and for this reason it is sometimes called the 'working memory'.

c What are the four main characteristics of short-term memory?

Limited capacity (7 items); short duration (30 seconds); easily disrupted;

processed (rehearsed) information retained and transferred to long-term memory,

otherwise lost

d DCR occurs within the short-term memory. What does DCR stand for?

D – detection;

C – comparison;

R - recognition:

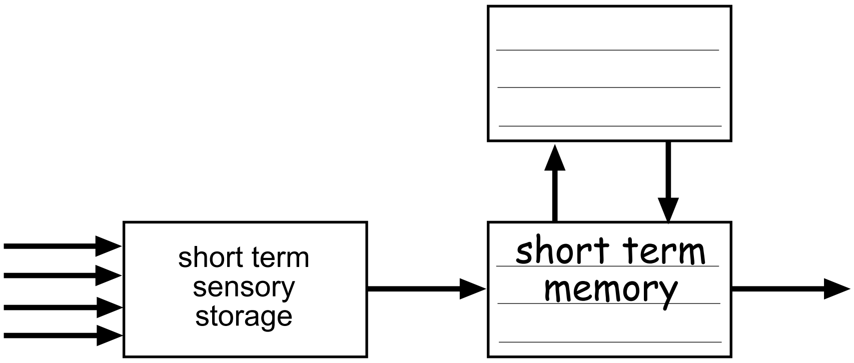
e STM is also important for the coach. Because of the limited capacity of the STM, instructions should be:

- Brief
- Succinct
- Given when learner is paying attention.

Otherwise the information will be lost from the STM before the learner can use it.

Selective attention lengthens the time that a stimulus remains in short term memory.

Place short-term memory in the following information processing model.



f Long-term Memory (LTM) is where all information that enters the STM that is rehearsed, is stored. All information in the STM is either stored in the LTM or lost.

If a basketball player may have played against a defender on a number of occasions, what information might be stored in the LTM and how might it effect their response?

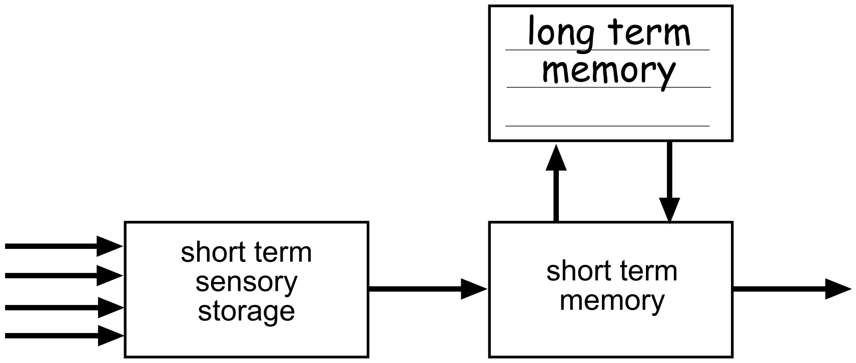
knowledge of defenders previous responses to moves; knowledge of own moves against defender and their success/failure; player will decide own moves based on previous successes/failures

g The LTM is therefore a store of well-learned past experiences. The information held in the LTM is used to compare against new experiences. It also stores responses used in these different situations.

Retention and retrieval of information from LTM is influenced by:

- **Rehearsal** - the more a memory is rehearsed, the more likely it is that it will be remembered
- **Meaningfulness** - the more meaningful a memory is, the more likely it is to be remembered
- **Speed of learning** - the quicker a process is learned, the more likely it is to be remembered
- **Overlearning** - the more a skill is practised, even when perfected, the better it will be remembered

Place long-term memory in the following information processing model.

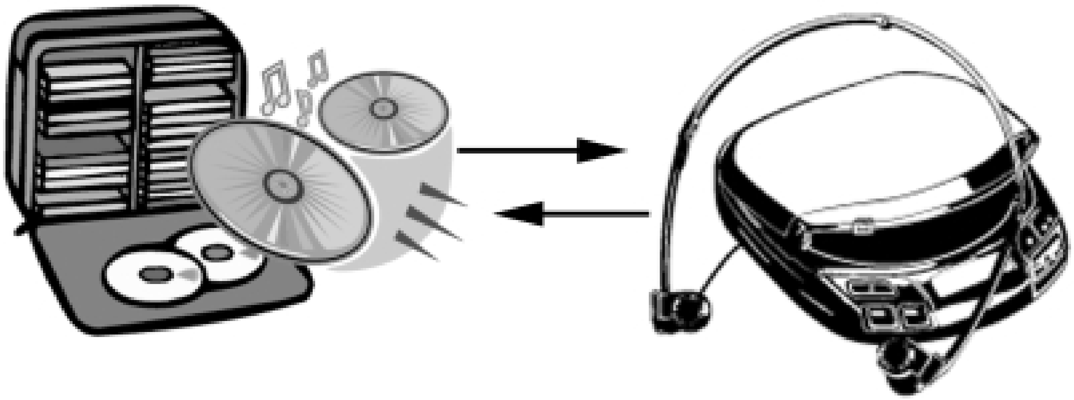


All of the processes discussed so far involve information that appears to be stored in some way within the Central Nervous System. Psychologists refer to this idea of changing and storing information as coding.

h Two of the components of memory – Short-term memory and long-term memory, may be thought of as a CD system. The rack of CDs is your long-term memory.

The CD store can be as big as you need (buy more racks!), but CDs will not work without the CD player. The CD player is your short-term memory. The system only works if the player plays the CD. No player, no music! Short-term memory is the working memory.

Explain your understanding of this idea by adding the main features of short and long-term memories in the appropriate boxes.



CD Collection	**CD Player**
CD rack - the long-term memory	The CD Player - the short term
has limitless capacity; long duration.	memory limited capacity (7 items);
often permanent; Problem is one of	short duration (30 seconds); easily
retrieval rather than storage	disrupted; processed (rehearsed)
	information retained and transferred
	to long-term memory otherwise lost

i Short and long-term memories are both involved in perception. A tennis player's previous experience tells them that they must watch the ball. Further experience tells them to watch the action of the racket so as to predict the flight of the ball, to refer to their long-term memory to predict the bounce of the ball, and what type of stroke is required in this circumstance, the memory of which is also stored in long-term memory.

In other words the player constantly moves between new and old information to perform the correct stroke. Thus past experiences from long-term memory are brought into short-term memory and the new information is compared to it.

Suggest reasons why the experienced player is better able to deal with these processes than the novice.

The experienced performer is able to deal with these processes for two reasons - they can process the information quicker, and they have a greater capacity to process the information

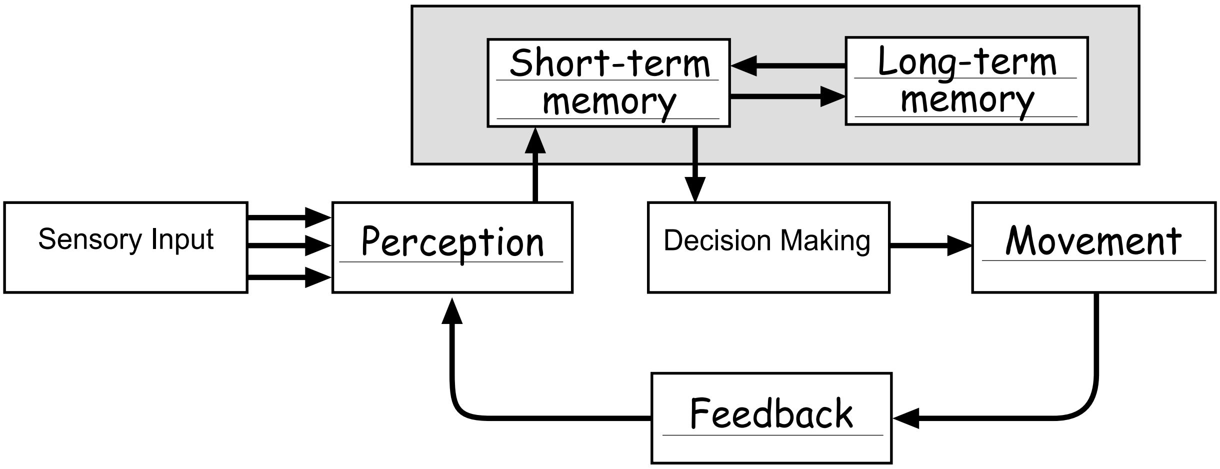
j Memory can be improved by:

- **Rehearsal** – practice helps retain information in long-term memory
- **Avoid interference** – confusion is caused by conflicting (similar) information
- **Association** – linking new information to old information improves memory. The new information becomes more meaningful because it is associated with old information
- **Organisation** – making information meaningful assists retention. Thus learning one gymnastic move allows a second move to be added and so build up a sequence
- **Imagery** – images are the best way of remembering. The more vivid (unusual) the image the better
- **Chunking** – more information can be handled if it is linked together

Explain how memory can be improved.

Improved by practice; making situation meaningful; using images; associating with other memories;

k Label those parts of the information processing model shown in the diagram below.


Short-term memory
Long-term memory
Sensory Input
Perception
Decision Making
Movement
Feedback

k

Part 17 Teaching Resource

‘Making and Perfecting Movements’

General Considerations & Objectives

Teaching Objectives **What the students are expected to learn**

1. To allow students to understand the variety of feedback that occurs during movements, and its classification
2. To permit students to develop knowledge of the concept of motor programmes
3. To help students understand Schmidt's schema theory.

Tasks **What the students are expected to do**

In this study pack you will find a range of tasks requiring the students to develop their understanding of motor programming. They will need to:

- Develop an understanding of the different forms of feedback and its effect on the learning process
- Develop an understanding of the output process
- Clarify the theories involved in motor programming

The tasks may be approached in isolation, or preferably following an introduction in the classroom and practical experience of the processes involved in the gym/sports hall, including feedback deprivation and the learning of a novel skill using established schema.

The student's work could simply be assessed as answers to questions, or it may be assessed as part of a groups work, or through class discussion.

Be prepared to answer questions and to make suggestions.

A list is provided of a number of suitable textbooks. Your centre may also have suitable posters, videos that will help. Always remember that the teacher is ultimately the best resource. Independent learning does not mean don't ask me!

Task 1 Feedback

a Feedback is defined as 'the information received during or following a movement, which informs the performer about the effectiveness of the response.'

Feedback is information from our senses that we receive about our performance.

Think of a novice performer completing a closed skill such as a tennis serve. Name four different 'bits' of information they will receive after completing the skill?

1 E.g. We see where the ball lands;
2 our coach tells us what we did wrong;
3 we feel a miss-hit;
4 we hear a ball being called out, etc;

b One of the most important aspects of learning, is the use of feedback about actions attempted in practice to improve subsequent performance. In fact, without feedback, there can be no learning.

Feedback can be a natural result of a movement, as in seeing the flight of a golf ball, or feeling the rounder's bat make contact with the ball.

Feedback can also be given in 'artificial' forms, such as the performer's score in a diving competition, or a comment from a team-mate about a soccer pass. Often, verbal feedback is from the instructor, and makes up a large part of practice organisation.

What are the three major functions of feedback?

1 change an incorrect response;
2 reinforce a correct response;
3 motivate the performer;

Feedback is information provided as a result of the movement (fed back to the performer)

c Feedback may then be split into two categories, intrinsic feedback and extrinsic feedback.

Intrinsic feedback (also called inherent feedback) is information provided as a natural consequence of making an action. Intrinsic feedback is feedback arising from the movement itself.

Give examples of four types of intrinsic feedback that you receive during a tennis stroke.

1 E.g., when you swing a racket at a tennis ball, you feel your body move.

2 you see the racket travel

3 you hear and feel the racket strike the ball

4 and you see the ball travel into the net

All this information is conveyed to you through your senses. You might also hear crowd noise, smell, and feel the wind, feel the grip on the racket, etc.

d Extrinsic feedback (also called augmented feedback) is information from the performance that is fed back to the performer by some artificial means.

Give examples of four types of extrinsic feedback that you could receive.

1 E.g., a teacher's voice giving corrections

2 your time for the 100 meters

3 a diving judge's score

4 video replays of performance a coach painting stripes on a ball to illustrate the spinning action etc.

Extrinsic feedback is thus supplied above and beyond intrinsic feedback. Extrinsic feedback is sensory information that is increased or magnified. It supplements or augments the naturally available intrinsic feedback. It is this feedback which the coach can control.

e Knowledge of Results (KR) is a very important category of extrinsic feedback. It is information (usually verbal), about the success of an action with respect to the environmental goal. It is received once the action is finished (terminal).

On many occasions KR is not needed because your own intrinsic feedback provides the necessary information. Telling the striker that he's just scored, or telling the gymnast that she's just fallen off the beam, are examples of KR duplicating intrinsic feedback that the performer has already received.

But there are occasions when the performer cannot see the results of his actions, e.g., target activities, sports where judges give marks. In these cases, KR is critically important, as the learner will be largely unaware of errors without KR.

Imagine you are a novice performer completing a closed skill. Identify the type of information that is classified as knowledge of results.

E.g., gymnast judge's score, racket game service in or out, ball game set piece successful or unsuccessful

KR has been widely researched, as it is fairly easy to deprive subjects of KR. The results of this research may be summarised as:

- If learners have no knowledge of their own errors (no intrinsic or extrinsic feedback), then practice results in no learning.
- However, extrinsic feedback, in the form of KR generates rapid and permanent learning
- Generally, information about errors, either from intrinsic or extrinsic sources, is essential for learning to occur.

f **Knowledge of Performance** (KP) is supplementary (augmented) information about the movement pattern the learner has just made.

KP is frequently used by coaches, when they say things like 'that ball toss was too short' or 'you were not tucked enough in that somersault'. These give the performer information about movements.

KP unlike KR, does not necessarily tell about the success of a movement in terms of the environmental goal. Rather it tells about the success of the movement pattern the performer has actually produced.

Complete the following table that compares KR and KP

	Knowledge of Results (KR)	Knowledge of Performance
	Similarities	
Form of guidance	Verbal	Verbal
Intrinsic or extrinsic	Extrinsic	Extrinsic
When	After performance	After performance
	Differences	
Type of information	Information about in terms of environmental goals	Information about movement production or patterning
Comparison to intrinsic feedback	Usually redundant with intrinsic feedback	Usually distinct from intrinsic feedback
Summary	Information about the score or goal	Information about kinematics

g What are the three major benefits of feedback?

1 It produces motivation

2 It supplies reinforcement of correct and incorrect actions

3 It provides information about errors as a basis for corrections.

h Complete the following table to identify the different forms of feedback.

Feedback	Description
Intrinsic	A natural consequence of performance
Extrinsic/augmented	Provided by teacher/coach/video
Positive	Information about a successful action
Negative	Information about an unsuccessful action
Concurrent	Occurs during performance
Terminal	Occurs after performance
Immediate	Occurs immediately following the action
Delayed	Occurs at varying periods after the action
Knowledge of performance	Feedback which gives information about the movement of the action
Knowledge of results	Feedback which gives information about the end product of the action

i How is the ability of performer in terms of stages of learning, reflected in the type of feedback that they can deal with?

Learners (cognitive stage) – rely on augmented KR; must be immediate.

Experts (autonomous stage) – ability to use kinaesthetic feedback developed

j What type of feedback does a coach provide?

Coach's feedback is extrinsic/augmented, often terminal, usually positive and Knowledge of Performance

Task 2 Motor Programmes

a Responses in sport can often appear like reflexes. Invariably they are more complex as they involve decision-making.

Without warning, **safely** throw a soft object at a friend! Describe what happens?

Usually friend catches object

If they moved their hands into position to catch the object, this would suggest they already knew how to complete this action. These actions must have been programmed in advance. Motor programmes are generalised series of movements stored in the long-term memory. Motor Programmes are ‘A set of movements stored in the memory regardless of whether feedback is used in their execution’.

b How would these movements been programmed?

Motor or movement programmes are developed and stored in long-term memory through well-guided and well-informed practice over a long period of time.

These programmes can be simple or complex

c In which part of the information processing model are motor programmes selected?

Part of translation process (decision making) is the selection of the motor/movement plan or programme that is to be implemented

d Where are motor programmes stored and how are they retrieved?

Motor programmes are retrieved from the long-term memory by a single decision

e Three theories, seek to explain motor programmes, what are they?

1 Open Loop theory;
2 Closed Loop theory;
3 Schema theory

f Open Loop theory

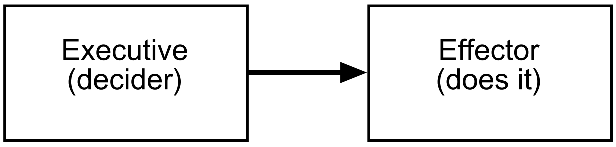
Find an experienced typist hard at work in your centre's office. Without warning, shout 'stop' as they have just started to type a word. What happens? Do they:-

i Complete the word?
ii Stop immediately?
iii Ignore you and get you kicked out of college?

Assuming (a) was the answer, this supports open loop theory, which suggests that some motor programmes are so well learned that they do not rely on feedback.

This type of motor programme is controlled by an open-loop mechanism. In an open loop mechanism there is no feedback.

A model of an open loop system might be:



g What are the characteristics of open-loop systems?

pre-planned instructions of what is to be done, their sequencing (order) and timing;
once initiated, the system goes through without modification; no capacity to detect
errors (no feedback); they are most effective in stable environments where there is no need for modification;

h What type of movements are thought to be controlled by, involve control by open-loop systems?

quick and forceful, e.g., kicking and throwing, and we have no conscious control over them

i Describe how an open loop motor programme is selected and used in a skill such as striking a ball.

The executive evaluates the environmental information, e.g. the speed and direction of the ball.
A decision is made - strike the ball, and the movement is programmed – speed of bat swing - in the response programming stage.
Control passes to the effector for the execution of the movement.
The selected motor programme carries out the swing movement, by delivering commands to the appropriate muscles to contract in order.
Hence the executive decides which motor programme to use, whilst the movement is controlled by the motor programme without any further conscious control.

j What effect does practice have on motor programmes?

Practice leads to developing new, more effective, more stable, more precise or longer-operating motor programmes.

Practice makes complex motor programmes more simple and thus releases more conscious control for other details of the movement

k Complex skills being broken down into component parts (sub routines). These sub-routines are so well learned the performer does not need to think about how to perform them. Well-learned sub-routines are organised and stored as executive programmes.

Tennis could be an example of a motor programme. What are the sub-routines of the tennis serve?

preparation/stance; ball toss; racket swing; weight transfer or follow through; ball strike or follow through

l You learn a motor programme as a response to a certain situation and then remember that programme and repeat it if the situation arises again. The memory thus has a store of muscle commands in the form of a motor programme that can be put into action. These commands can be stored in the brain or spinal cord, and once a programme is 'run', muscles receive impulses in a pre-determined sequence, at pre-determined intervals and with pre-determined strength.

When this motor programme produces a response that matches the requirements of the situation, then skilled performance results.

Performers can initiate inappropriate motor programmes. They may not have learned the appropriate programme, therefore produce unskilled movements.

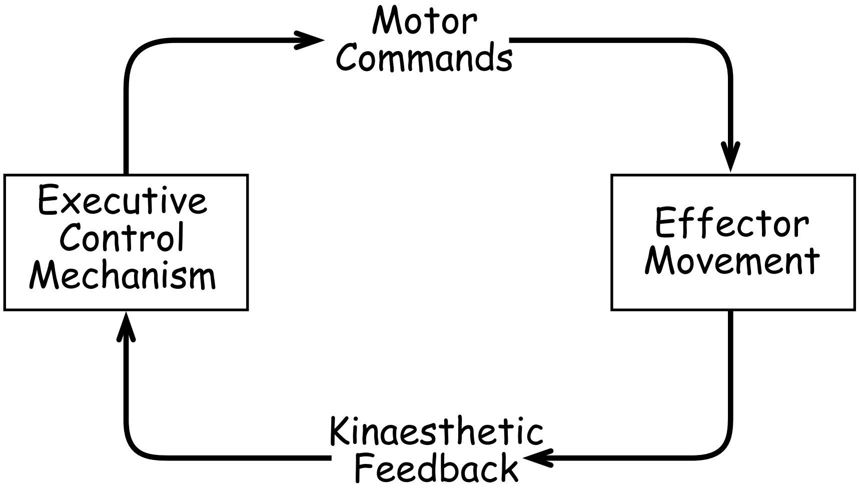
Why is open loop theory not applicable to every movement?

Too many stored movements for memory capacity.
It only stands up as a theory if conditions are predictable and stable.
It does not account for novel task.
It does not account for mover's flexible movement patterns. It is not applicable to open skills

m Closed loop Motor Programmes

Closed loop theory depends heavily on the idea of feedback, so that incorrect performances can be adjusted as learning takes place. Feedback is supplied during and after performance, this allows for the appropriate and continual error adjustment to be made.

In the space provided below, draw a model of closed loop theory.



Skilled performance is achieved through continually adjusting the movements until perfection is achieved. The learner compares KP and KR with reference to a model of correctness. A perceptual trace exists as a reference of correctness. The more the action is repeated the stronger the trace becomes. Practice results in the performer having a better understanding of what it feels like to perform the skill well!

n What are the problems with closed loop theory?

It does not explain fast ballistic actions.
It does not account for movement where no feedback exists. Does not explain the benefits of variability of practice

o Schema theory

Although closed-loop theory explains the learning of skills quite well, and open-loop theory is a good way of explaining how high levels of skill performance are achieved, they do not comprehensively explain how we perform so many actions in sport, with little conscious control and with such a limited storage space for motor programmes.

Schmidt (1975) proposed a "schema" model of learning to compensate for the problem of memory capacity. Copies of actual movements are not stored in memory, rather ideas of relationships (schema) are stored that can be used to produce different, but related movements.

There are two parts to this theory recall and recognition. Recall is like open loop theory it can account for fast ballistic actions. Recognition is like closed loop in that it allows feedback to have an effect on movement.

What, according to Schmidt, is temporarily stored in memory every time we perform a movement?

1 Initial Conditions
2 Movement requirements or parameters
3 Outcome of the movement
4 Sensory consequences

This information is stored long enough for relationships to be recorded.

p Which schemas are used in recall?

1 Initial conditions

2 Response specifications(movement outcomes

For example when learning a javelin pass the performer can see the person who they are intending to pass too **(Movement Outcome)**. They need to take this into consideration **(Initial Conditions)** and adjust the force in order to achieve the movement outcome. This tells them how much shoulder rotation and muscular force **(Movement Parameters)** are to be applied in order to achieve the movement outcome. They may not have thrown such a heavy ball before; perhaps they have only ever thrown a tennis ball in this manner.

The performer has **adapted** the basic throwing action of the javelin pass.

q What schemas are used in recognition?

1 Sensory consequences

2 Response outcomes

Recognition schema also incorporates the fourth item of information stored, sensory consequences. The recognition schema is thought to guide movement production by comparing expected sensory consequences with the actual consequences.

r A Gymnast balancing on a beam knows what the action is expected to feel like and compares the information supplied by her senses. What information is stored by the gymnast for the other three criteria?

1 Movement Outcome – they are aware of what it feels and looks like to be balanced;

2 Response Parameters/ Specification – they know how much muscle strength is needed to keep the body stable;

3 Initial Conditions – they take these into consideration and adjust their body position

Hence, when confronted with a new or novel situation, the performer makes an attempt at a skill, based on schema, and through practice, will quickly improve, and soon get to a standard that is as good as his/her other, similar skills. The skilled performer then relies on the variety of the schema that he has encountered, in other words, his/her experience.

Schema theory allows for the adaptation of a general movement pattern for a specific action.

s How could coaches use their knowledge of schema theory when teaching?

Teachers and coaches should account for schema by ensuring their lessons are varied; Highlighting the action through slow motion practice; Feedback should be continuous being both positive and negative; Terminal feedback will strengthen the schema in the memory;

The skills to be learnt should be placed in as realistic a situation as possible, therefore ensuring there are transferable elements; Learning should take place within a game situation;

Ensure the tasks are challenging, build in error production

Part 18 Teaching Resource

‘Practice makes Perfect’

FELTHAM PRESS

General Considerations & Objectives

Teaching Objectives **What the students expected to learn**

1 To allow students to develop their understanding of the variety of forms of presentations of practice

2 To permit students to develop their knowledge of which form of practice to use in various situations

Tasks **What the students are expected to do**

In this study pack you will find a range of tasks requiring the students to develop their understanding of motor programming. They will need to:

- Develop an understanding of the different forms of practice situations
- Develop an understanding of when to use which type of practice

The tasks may be approached in isolation, or preferably following an introduction in the classroom and practical experience of the processes involved in the gym/sports hall, including feedback deprivation and the learning of novel skill using established schema.

The student’s work could simply be assessed as answers to questions, or it may be assessed as part of a groups work, or through class discussion.

Be prepared to answer questions and to make suggestions.

A list is provided of a number of suitable textbooks. Your centre may also have suitable posters, videos that will help. Always remember that the teacher is ultimately the best resource. Independent learning does not mean don’t ask me!

Task 11 Presentation of practices

Summaries of main choices available:

Whole or part

	Whole	Part
If the task:	Has highly dependent parts Is simple Becomes unmeaning in parts Cannot be divided into parts	Has highly independent parts Is complex Is made up of individual skills Can be split into parts
If the learner:	Is able to remember whole skill Has long attention span Is highly skilled	Has limited memory span Finds one aspect very difficult Cannot suceed with whole method

Massed or distributed

	Massed	Distributed
If the task:	Is simple, repetitive, boring Has few elements Does not require warm up Is known to the performer Little concentration Is not fatiguing	Is complex Has many elements Requires warm-up Is novel for performer Demands intense concentration Is fatiguing
If the learner:	Is mature Can maintain concentration Is able to focus attention Has stamina	Is young Has short attention span Cannot concentrate for long periods Fatigues easily

Command or discovery

	Command	Discovery
If the task:	Involves large groups Requires little thought Is a dangerous activity	Involves small groups Requires diversity of thought Is a safe activity
If the learner:	Is short of time Is a beginner	Needs to progress at own rate Knows what is required

Form of guidance

	Visual	Verbal	Manual
If the task:	Is complex	Requires cues to highlight points	Is dangerous
If the learner:	Is in cognitive stage	Associative or automonous stage	Is novice or fearful

For each of the following skills and situations, decide whether you would best teaching it through whole or part practice, massed or distributed practice, which teaching style you would use, and which form of guidance you would use. For each answer given, you must justify (give reasons for) your choice.

Skill - Long Jumping - sprinter who wants to learn a new skill

Form of Practice	Type Used	Justification
Whole/Part	Part	Already proficient at run up - work on take-off, flight and landing
Massed/Distribut	Distributed	Fatigue likely with massed
Teaching Style	Command or Discovery	Both would work - discovery better for individual
Guidance	Visual	Novice at jumping - demonstrate skill

Breaststroke Swimming - experienced performer in another stroke

Form of Practice	Type Used	Justification
Whole/Part	Part	Complex Skill
Massed/Distribut	Distributed	Fatigue likely
Teaching Style	Command	Dangerous
Guidance	Visual and	Demonstration best for cognitive learner, but dangerous skill

Front Somersault on Trampoline - young novice performer

Form of Practice	Type Used	Justification
Whole/Part	Part	Complex, unable to be reduced into parts
Massed/Distribut	Massed	Complex task - not fatiguing
Teaching Style	Command	Dangerous
Guidance	Manual	Dangerous

Tennis Serve - experienced player with readily identifiable weakness

Form of Practice	Type Used	Justification
Whole/Part	Part - Whole	Able to be broken down into parts and re-assembled
Massed/Distribut	Massed	No fatigue
Teaching Style	Command and Discovery	Initially command, then more discovery as skill is learned
Guidance	Verbal	Weaknesses to be highlighted

Volleyball 'dig' - automonous stage learner

Form of Practice	Type Used	Justification
Whole/Part	Part - Whole	Able to be broken down into parts and re-assembled
Massed/Distribut	Distributed	Non-fatiguing
Teaching Style	Command and Discovery	Highlight point permit individual learning
Guidance	Visual and	Highlight weaknesses

General Considerations & Objectives

Teaching Objectives

What the students expected to learn

To permit students to develop their knowledge of motivation

Tasks

What the students expected to do

In this study pack you will find a range of tasks requiring the students to develop their understanding of personality and motivation.

The tasks may be approached in isolation, or preferably following an introduction in the classroom and practical experience of the processes involved in the gym/sports hall.

The student's work could simply be assessed as answers to questions, or it may be assessed as part of a groups work, or through class discussion.

Be prepared to answer questions and to make suggestions.

A list is provided of a number of suitable textbooks. Your centre may also have suitable posters, videos that will help. Always remember that the teacher is ultimately the best resource. Independent learning does not mean don't ask me!

Task 12 Personality

a Motivation and learning

What do you understand by the term motivation?

Motivation is why people do what they do

b Sage (1974) defined motivation as 'the **internal mechanisms** and **external stimuli** which **arouse** and direct our behaviour'. Explain the meaning of each of the underlined parts of this definition.

Internal mechanisms mean our inner drives towards achieving a goal or outcome;

External stimuli mean the pressures and rewards that we may gain, seek or avoid, from those around us;

Arousal means how intense is our behaviour.

Intrinsic – from within – participation for sheer fun/enjoyment (self-satisfaction); Extrinsic – from without/outside – playing for rewards

d With regard to extrinsic motivation, divide external rewards into two categories.

Tangible –concrete, such as badges and medals;
Intangible – untouchable such as praise from others

e Which form of motivation is better for continued participation?

The vast majority of research into motivation has concluded that intrinsic motivation is far better than extrinsic

f What are the problems associated with an excessive emphasis on external rewards?

The performer may end up doing the activity just for the reward; Enjoyment of the activity is lost;
Extrinsic reward if not valued will not develop intrinsic motivation;
Extrinsic rewards can lose their power

g What implications do a knowledge of motivation have for the teacher and coach?

practices should be:
Challenging, Interesting, Attainable, Relevant,
Evaluated Beginners should:
understand the relevance of training drills;
Receive positive feedback based on knowledge of results;
Selective simple feedback on knowledge of performance.
The skilled performer should receive:
Knowledge of performance regarding fine precise movements;
Help in developing kinaesthetic feedback;
Some Negative feedback.

Many people play for a combination of intrinsic and extrinsic rewards, e.g. the sporting millionaire who strives for continued success.

k

Part 20 Teaching Resource

‘The spread of sport – Not Just the Public Schools’

FELTHAM PRESS

General Considerations & Objectives

Objectives

- To understand how rational recreation spread from the public schools throughout an increasingly enthusiastic society.
- To identify the effect that an increasingly industrialised and technological society had upon the spread of rational recreation.
- Understand the influences of the universities, the church, business/industry, armed services, foreign diplomatic service and the trade unions upon this development.
- How the growth of rational recreation reflected the increasing influence of the middle class and the effects it had upon the role of the middle class within society.
- The ethical and philosophical concepts of ‘athleticism’ and the ‘gentleman amateur’

It is important that students understand that the old boys from the public schools and the extraordinary changes that were occurring in society during this time both had an effect upon the development of rational recreation. Too often students consider that the public school old boys were the sole ‘developers’ of rational recreation. This is part of a general requirement for students to understand that sport and physical education do not exist in a vacuum – they are markedly influenced by the changing economic, cultural and social pressures of the period. It is also true to say that the philosophies of athleticism and the ‘gentleman amateur’ were also an influence upon society. Students should also appreciate that the development of opportunities to engage in rational recreation and leisure was heavily influenced by class structures and economic opportunity.

Teaching Strategy

- Students should be asked to undertake some basic research and also interpretation of the data given within this support pack. To undertake primary research of data from this period is too time consuming in the context of an examined unit – unless it was being developed for a Key Skills assessed piece of work.
- Using the resource sheets students can initially demonstrate the progression routes for the development of rational recreation by constructing a flow chart. The resource sheet can be photocopied and cut up into sections for use by individual or groups of students.
- Production of a spider diagram/mind map will show the various influences that affected the development of rational recreation. The resource sheet can be used by asking the students to match up the influencing factor with the process. This is most easily done by photocopying and cutting up the sheet.
- Drawing up a table to show the differences that caused the 'rugby split' is a useful jumping off point for a discussion of the amateurism/professionalism schism. This can be further developed by asking students to consider the differences in terms of opportunities and provision between the working and middle classes of the time.
- The debate can be set up as group activity, getting individual students to research and prepare short debating points linked to the main question. It would be possible to us this task to develop a large piece of work for Key Skills communication and IT.

‘Influences on the Development of Rational Recreation’

INFLUENCING FACTORS – WHAT?

Established Church

Armed Forces

Industrial/Business Managers

Railways

Local Government

Newspapers

British Empire/Colonial Service

Trades Unions

Roads

The Romantic/Countryside Movement

Universities

‘Influences on the Development of Rational Recreation’

INFLUENCING FACTORS – HOW?
Formation of Sunday School based sports teams
Use of Church facilities and land for sporting and physical recreational purposes
Provision of inner city parks
Improved wealth of local/municipal government
Increased provision of municipal baths
Demands by the Trade Unions for a shorter working week
Granting of Saturday half days
Development of fixtures on regional basis
Development of YMCA physical recreation provision
Improved railway provision/network
Development of works based teams
Provision of recreational facilities for workers

‘Influences on the Development of Rational Recreation’

INFLUENCING FACTORS – HOW? *cont.*

Development of sport opportunities for Colonial administrators, diplomats and military personnel

Playing with or against members of the indigenous population in a colony.

Use of sports reports and eventually photographs in newspapers/pocket journals

Attendance at sports fixtures as a spectator

Formation of sports teams in the army and navy bases/regiments etc

Railways allowed greater access to hills and mountains by ramblers and mountaineers

Gradual increase in wealth allowed increasing numbers of people and social classes to engage in recreational activities.

Development of the use of the bicycle – means of transport and recreation

‘Influences on the Development of Rational Recreation’

INFLUENCING FACTORS – WHY?

Desire to increase attendance at church by the young working classes

Middle class Christian concern for the welfare of the poor

Deter working classes from drinking in public houses

Reduce possibility of working class revolt by assimilation of middle class values

Desire for a fitter healthier workforce

Development of feelings of loyalty, team work improvement in worker morale etc.

As an expression of British cultural dominance

To replicate opportunities from home when abroad

To reduce possibilities of colonial revolt by assimilating into British culture

To sell newspapers to a greater range of people

continued....

‘Influences on the Development of Rational Recreation’

INFLUENCING FACTORS – WHY? *cont.*

Development of regional/national competitions – raise standards

Use time off to watch sports fixtures (home and away)

Desire to return to rural roots, escape the cities

Improve the health and discipline of the soldiers

Desire to improve health and welfare of the poor through public provision

Students wished to play agreed versions and also against outside clubs

Improvement in working conditions and rewards for working people

Desire by working class to have recreational opportunities like the middle class

Improve comradeship in the armed forces

The Rugby Football Split 1894

RUGBY FOOTBALL UNION	NORTHERN UNION

Rational Recreation

The development of sport and recreation in a **respectable** form

What?

Individual activities - Swimming, Athletics, Gymnastics, Contents (Boxing, Archery etc.), Outdoor Pursuits

Games - Football, Rugby, Cricket, Tennis

Each of these activities had different paths to codification, amateur-professional divide etc.

Different time scale to development of NGB but most within 1850-1900

Regular fixtures - leagues, cups, internationals

How?”

Adaptation of existing activities - codifying, controlling, making respectable

Middle classes moved into the administrative levels - formation of NGB

Gradual agreement on defined, written body of rules

Popularisation led to increased interest - media driven - spectators - money

Effects of ex-public schoolboys/university blues - old boys clubs, industrial clubs, church clubs

Local government - new wealth - public facilities - public health - parks, baths etc.

Church - wealthy - land owner

Improved travel and communications

Why?

Need to have a disciplined, industrious, sober work force

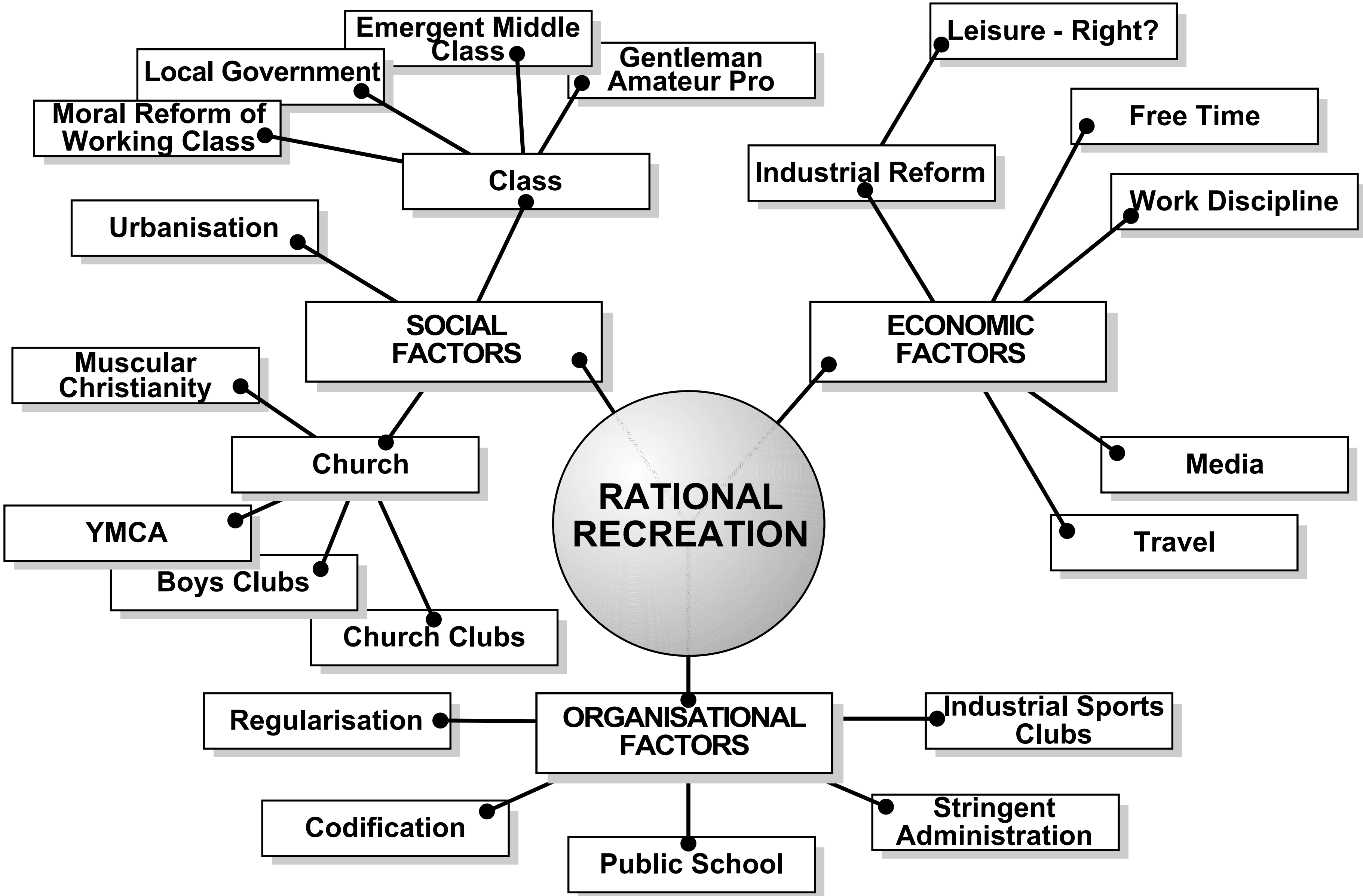
Development of an emerging business/professional/industrial middle class

Philanthropic concern for the working class - living conditions, health, sobriety (Temperance Societies)

Social/Industrial reform - TUC Chartists - restriction of working week - right to leisure

Practical Christianity - concern from the Established Church about lack of interest by Working Class and losses to Roman Catholic Church and Non-conformists - church clubs, Sunday School Boys clubs - religious organisations - using sport to attract/interest - control of older youths

The Development of Sport & Recreation in a **Respectable** Form



- RATIONAL RECREATION
  - SOCIAL FACTORS
    - Urbanisation
    - Class
      - Moral Reform of Working Class
      - Local Government
      - Emergent Middle Class
      - Gentleman Amateur Pro
    - Church
      - Muscular Christianity
      - YMCA
      - Boys Clubs
      - Church Clubs
  - ECONOMIC FACTORS
    - Industrial Reform
      - Leisure - Right?
    - Free Time
    - Work Discipline
    - Media
    - Travel
  - ORGANISATIONAL FACTORS
    - Regularisation
    - Codification
    - Public School
    - Stringent Administration
    - Industrial Sports Clubs

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Middle Class/ Working Class Opportunity Provision – End of the 19th Century

MIDDLE CLASS	WORKING CLASS
Use of private clubs - tennis, golf, etc.	Some, and improving, provision through municipal parks and baths
Membership of clubs socially restricted	Some provision made available by patronage from employers - works teams, facilities
Greater economic resources allowed more access for activities e.g. mountaineering, golf	Less economic resources although a gradual (even if uneven) improvement in general economic wealth with the more educated/skilled workers benefitting first.
Shorter working hours - more leisure time	Working hours gradually reduced starting with clerks and administrators then through the skilled workers, semi skilled, unskilled etc.
Middle class women had the time but had to battle to get the right to active leisure due to social restrictions	Working class women last to benefit
Ability to meet the strict 'amateur' criteria	Could not afford to lose pay to play. Through the nature of their education & employment would fail to gain access to certain competitions and clubs
Preparation for the cultural values, skills and knowledge of sports from public/private schools	Elementary schools gave no preparation for sport/physical recreation
Physical recreation sport was seen as a benefit and as a right. Seen to be an essential part of the development of a class born to lead.	Recreation seen as a means to an end & as a rewardfor the working class. Used to develop discipline, fitness, loyalty/subservience & as means of developing middle class values.
Provision often throughj Old boys teams eyc maintaining social links & developing networks	Provision through charitable institutions such as the church

Part 21 Teaching Resource

‘But what about the others? – Elementary schools and beyond’

General Considerations & Objectives

1 To develop knowledge of the characteristics of the provision for physical activity in elementary schools in the period 1890 – 1919.

2 To understand the opposing beliefs about the values objectives for pupils attending elementary schools foe physical activity.

3 To understand the external influences that were at play in determining the nature of physical activity in elementary schools. To understand the socio-economic changes occuring as a result of the 1st World War in relation to the impact upon physical education.

This is the story of how the provision of physical activity in our schools has developed from these early stages in elementary schools to the national curriculum that is now in place over a century later. Students will not be required to have a detailed understanding of each syllabus just the general changes and trends and the reasons for them.

In addition students should appreciate that the differences in provision between public and elementary schools as well as reflecting socio-economic factors also reflect the differences in expectation of the roles these groups would play in society when they left school. This includes the tasks they would be expected to undertake and the manner in which they would undertake them.

The debate over the nature of the elementary school provision for physical activity also reflected the growing knowledge of the beneficial effects of exercise upon the body. This was further enhanced by a general sense from a wide range of middle class philanthropists of the need to do something about the conditions of the working class children.

The 1st World War (1914-1919) produced an immense desire for a fairer and more equable society. Although there were in fact retreats from the freedoms gained by some, especially women, immedeately after the war in 1919 the process would continue, slowly but inexorably. This was a period of many contrasts - greater wealth for some coupled with the poverty experienced by many during the Depression.

One of the difficulties in teaching students about this period is to get over the feeling of immense dynamism and contradictions of the period. The striving for a greater economic share and more political influence by the working classes was a source of apprehension to the controling elite. Physical education and sport in schools, as well as having its own attractions to many was also seen as a means of occupying or placating those demanding a greater share and freedoms. The 1st World War laid the seeds of a rapidly increasing disillusionment with the inherent qualities of the ruling classes. Indirectly this paved the way for gradual raise in status, particularly in the popular press of professional performers in contrast to the amateur.

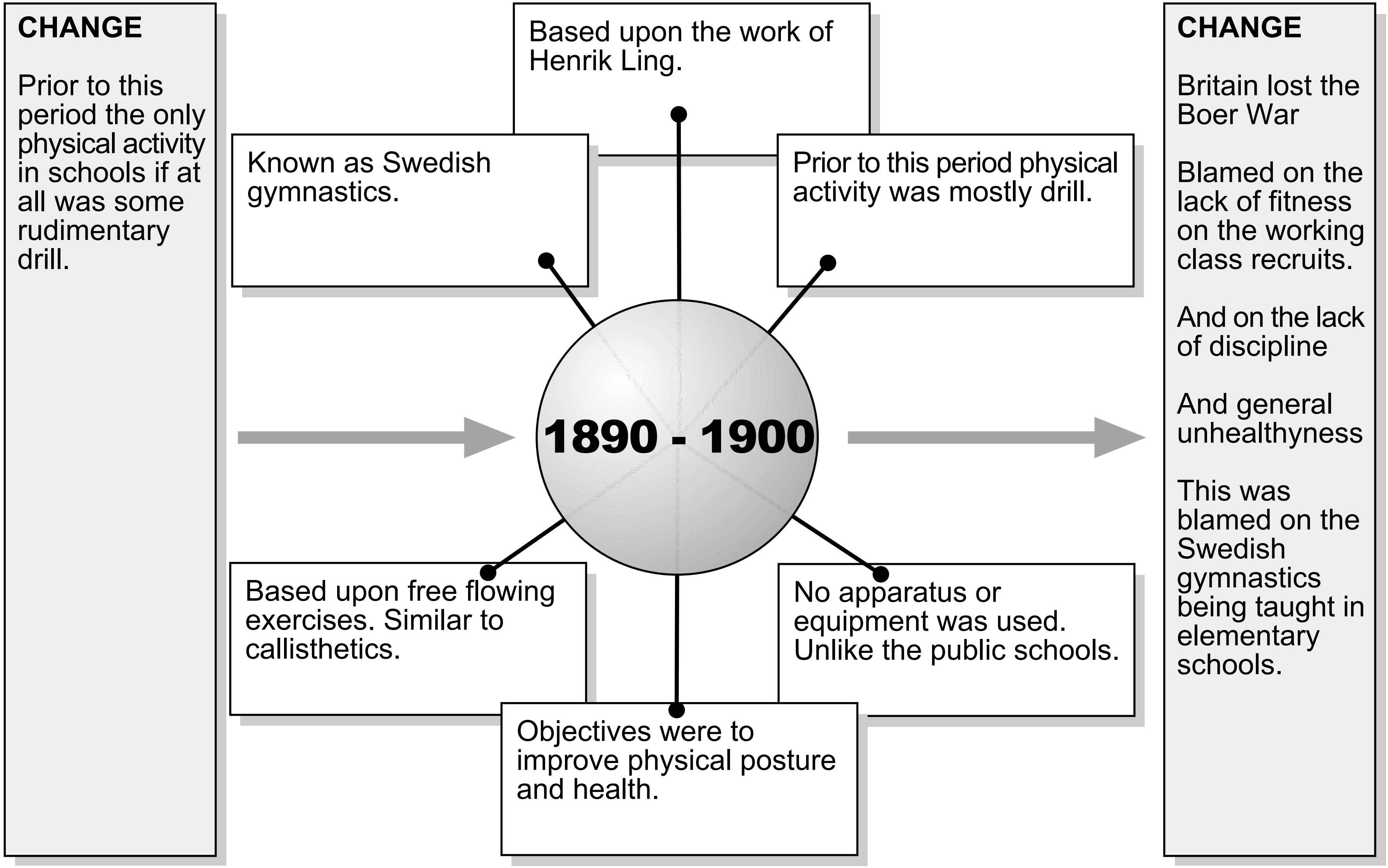
Teaching Strategy

1. Encouraging students to plan, take and experience lessons is an excellent way of getting a feel for the kind of activity. It also allows the students to address the issue of whether the activities they would be asked to do would actually meet the self proclaimed objectives of the various courses.
2. This requirement to reflect on the effectiveness of the activities can also reinforce the student's knowledge of anatomy and physiology and skill acquisition that have been learnt in other modules.
3. Most of the research can be undertaken through the standard textbooks. University libraries may well also have archive copies of instructional texts of similar exercises. Scouring through second hand bookshops can also be a useful way of building a library of historical texts.
4. The comparison exercises are vital as examination questions can often require students to see the similarities and differences between developing state school syllabuses. In addition the comparisons made between elementary and public school highlights the economic differences as well as the socio-cultural assumptions and expectations.
5. Exam questions are likely to focus on three areas:

   What was happening (in broad terms)?
   Who was involved?
   Why was it happening

   The students are not required to have detailed knowledge of the specific syllabuses but an overview of what changed and why. The ability to give examples of the kinds of activities used, styles of teaching etc. would enhance their answers in an examination setting.

1890 - 1902 Elementary Schools Physical Activity - Process of Change



CHANGE

Prior to this period the only physical activity in schools if at all was some rudimentary drill.

1890 - 1900

Based upon the work of Henrik Ling.

Known as Swedish gymnastics.

Prior to this period physical activity was mostly drill.

Based upon free flowing exercises. Similar to callisthetics.

Objectives were to improve physical posture and health.

No apparatus or equipment was used. Unlike the public schools.

CHANGE

Britain lost the Boer War

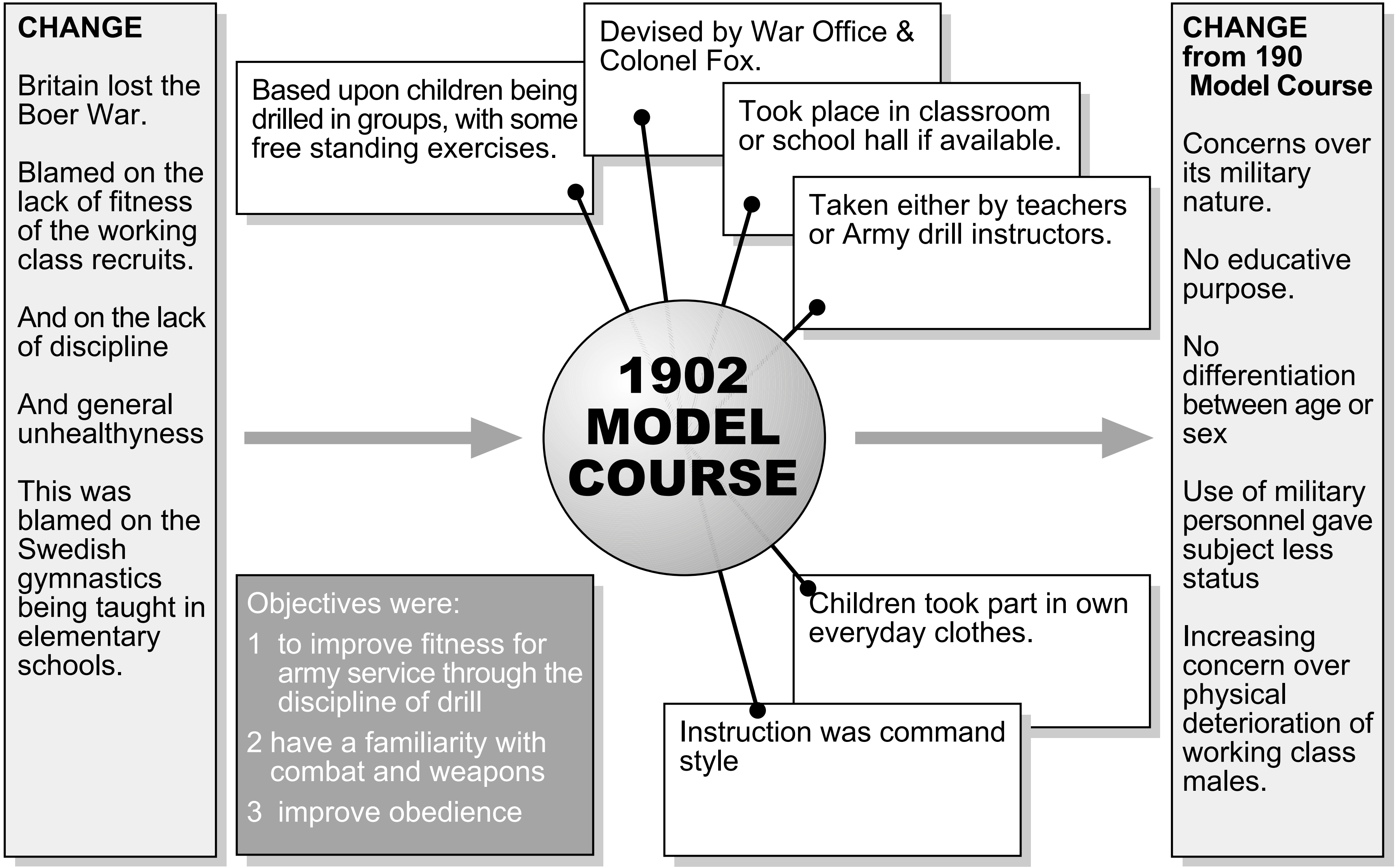
Blamed on the lack of fitness on the working class recruits.

And on the lack of discipline

And general unhealthyness

This was blamed on the Swedish gymnastics being taught in elementary schools.

1890 - 1902 Elementary Schools Physical Activity - Process of Change



CHANGE

Britain lost the Boer War.

Blamed on the lack of fitness of the working class recruits.

And on the lack of discipline

And general unhealthyness

This was blamed on the Swedish gymnastics being taught in elementary schools.

1902 MODEL COURSE

Based upon children being drilled in groups, with some free standing exercises.

Devised by War Office & Colonel Fox.

Took place in classroom or school hall if available.

Taken either by teachers or Army drill instructors.

Children took part in own everyday clothes.

Instruction was command style

Objectives were:

1 to improve fitness for army service through the discipline of drill

2 have a familiarity with combat and weapons

3 improve obedience

CHANGE from 190 Model Course

Concerns over its military nature.

No educative purpose.

No differentiation between age or sex

Use of military personnel gave subject less status

Increasing concern over physical deterioration of working class males.

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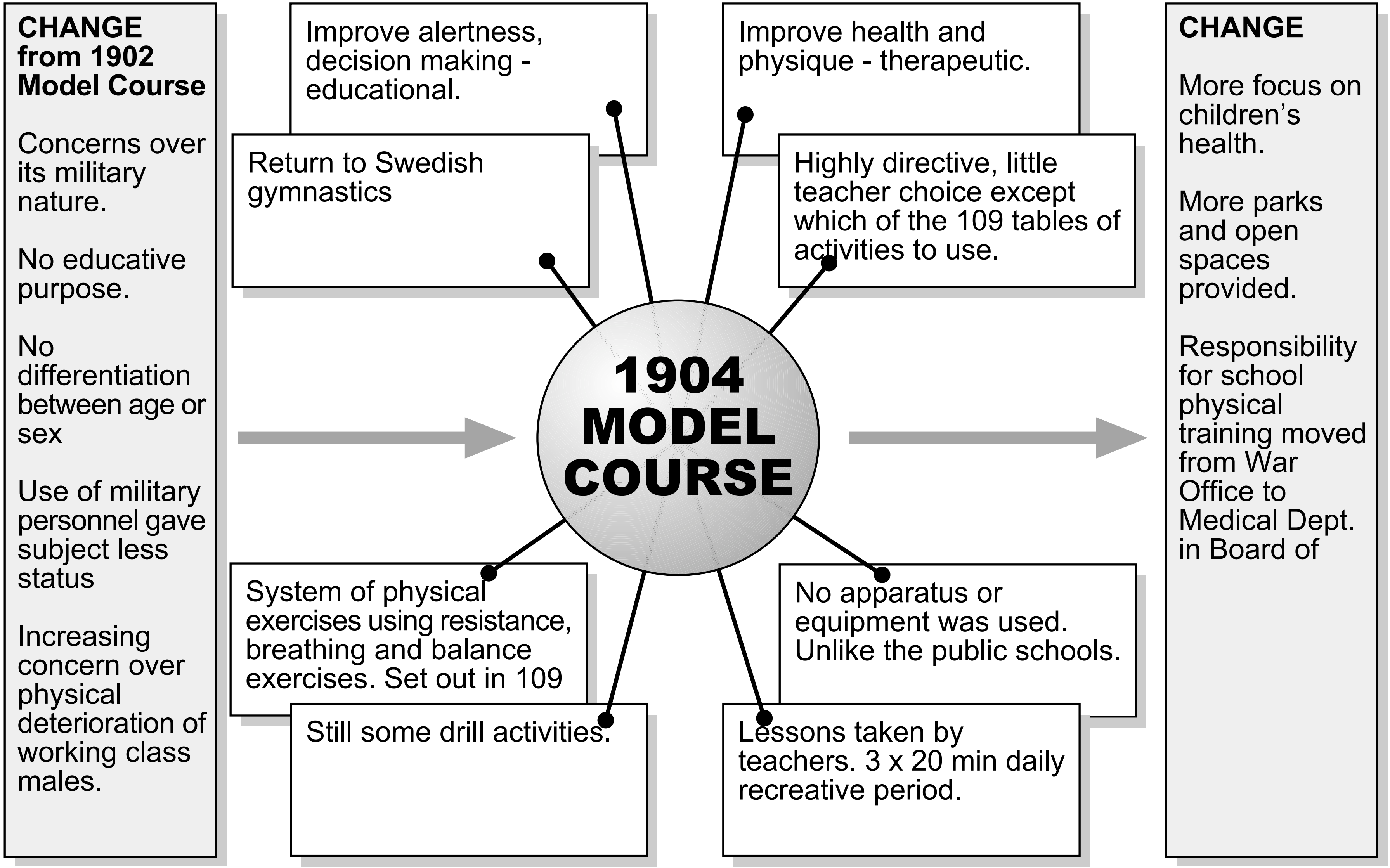
1902 - 1909 State Schools Physical Activity - Process of Change



CHANGE from 1902 Model Course

Concerns over its military nature.

No educative purpose.

No differentiation between age or sex

Use of military personnel gave subject less status

Increasing concern over physical deterioration of working class males.

Improve alertness, decision making - educational.

Return to Swedish gymnastics

Improve health and physique - therapeutic.

Highly directive, little teacher choice except which of the 109 tables of activities to use.

1904 MODEL COURSE

System of physical exercises using resistance, breathing and balance exercises. Set out in 109

Still some drill activities.

No apparatus or equipment was used. Unlike the public schools.

Lessons taken by teachers. 3 x 20 min daily recreative period.

CHANGE

More focus on children's health.

More parks and open spaces provided.

Responsibility for school physical training moved from War Office to Medical Dept. in Board of

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Sample Marching & Drill Exercise 1904

Drill Commands

The commands are printed in italics. It is important that commands are given accurately. An underlined word is lengthened as you say it, a word in bold it should be said in short, sharp manner.

Get the group to stand in two lines, with each person being an arm’s length from the next

Stand at ***ease*** *Atten* ***tion***

Stand at **ease** *Atten* **tion**

Arms bending and stretching: arms ***bend: out: bend: down:***

Arms bending and stretching: arms ***bend: out: bend: down:*** *stand at* ***ease***

Now for some marching

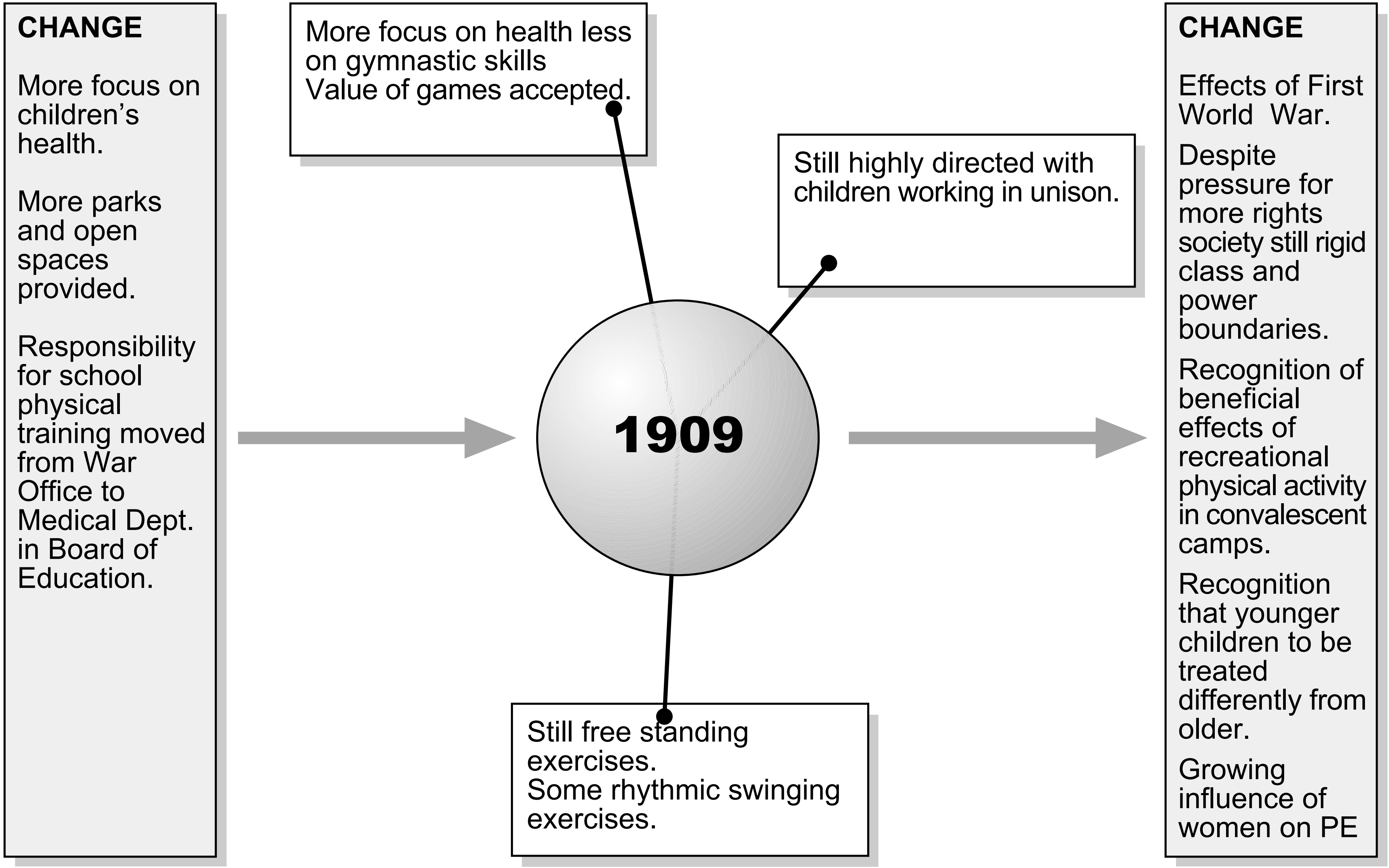
Atten ***tion:*** *right* ***turn*** *by the left, quick* ***march:***

left, right, left, right, left, right,......................

Halt: about **turn:** *by the left, quick* ***march: left, right, left, right, left, right, left, right,......................Halt:***

Stand at ***ease***

1902 - 1909 State Schools Physical Activity - Process of Change



CHANGE

More focus on children’s health.

More parks and open spaces provided.

Responsibility for school physical training moved from War Office to Medical Dept. in Board of Education.

More focus on health less on gymnastic skills
Value of games accepted.

Still highly directed with children working in unison.

1909

Still free standing exercises.
Some rhythmic swinging exercises.

CHANGE

Effects of First World War.

Despite pressure for more rights society still rigid class and power boundaries.

Recognition of beneficial effects of recreational physical activity in convalescent camps.

Recognition that younger children to be treated differently from older.

Growing influence of women on PE

1902 Model Course	1904 Model Course
Activities	**Activities**
Objectives	**Objectives**
Teaching Style	**Teaching Style**
Reasons for Change	**Reasons for Change**

1902 and 1904
Lesson Questionnaire

Please respond to these questions as if you had undertaken similar lessons on a regular basis over a term. Give reasons for your answer

1902 Model Course

1 Would your ability to march with a group of others have been developed?

2 Would you have accepted orders from another person more readily?

3 Would these kinds of activities have helped prepare you to fight as an infantry soldier?

4 Would these activities have improved any aspect of your physical fitness?

1904 Lesson

1 Would the activity undertaken improve your strength or sense of balance?

2 Would the activity undertaken have improved your posture?

3 Would the activity undertaken have improved your physical ability to lead a normal life?

4 Do you consider that you would have been physically developed?

General question

Were there any similarities between the two different approaches?

Elementary and Public School Comparison
Resource Sheet

Differences in Physical Activity, Strategies and Provision

Elementary School	Public School
Types of activitie	**Types of activities**
Facilities	**Facilities**
Run by	**Run by**
How taught/coached/led	**How taught/coached/led**

Impact of First World War

1st WORLD WAR 1914 to 1919

- Some diminishment of respect for officer class due to tactical incompetence.
- Lack of physical fitness of army recruits again blamed on schools.
- Loss of many of the public school educated men.
- Therapeutic value of exercise and physical recreation seen in convalescent camps.
- Post war increase in the working class expectations for a fairer society
- Huge loss of life from the war and post war flu epidemic.
- Women take over many jobs whilst men at war.

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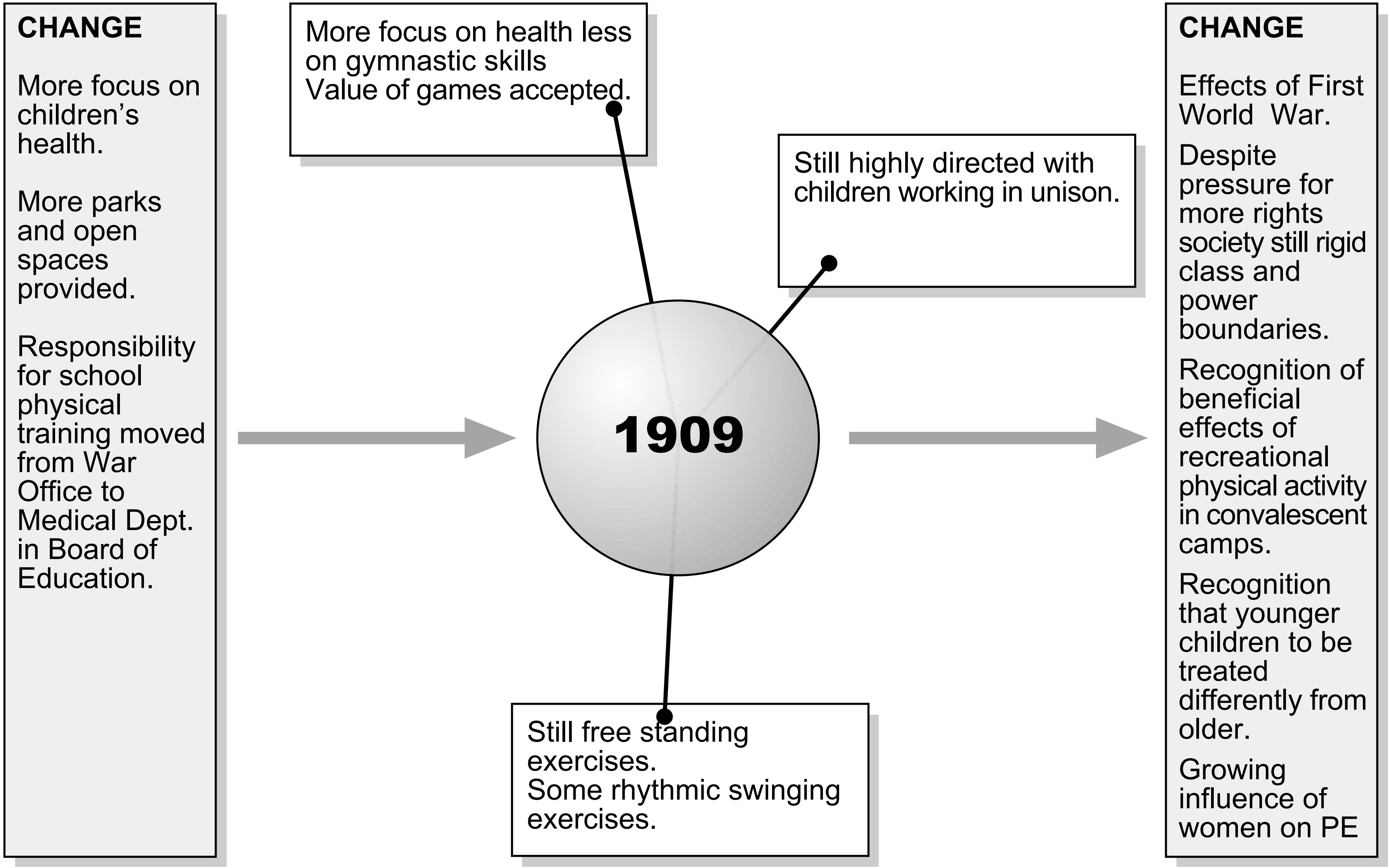
1902 - 1909 State Schools Physical Activity - Process of Change



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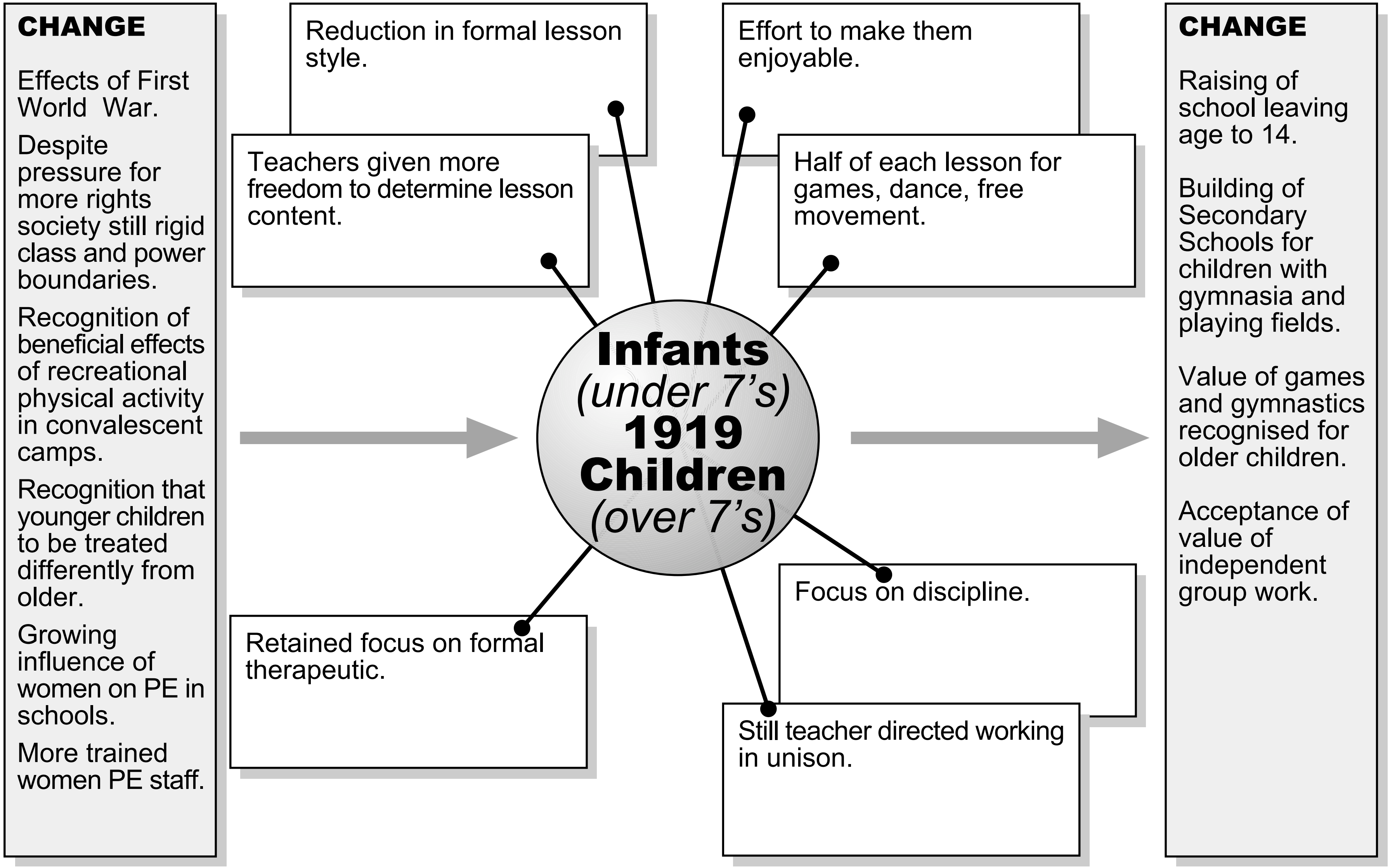
1909 - 1919 State School Physical Activity - Process of Change



CHANGE

Effects of First World War.

Despite pressure for more rights society still rigid class and power boundaries.

Recognition of beneficial effects of recreational physical activity in convalescent camps.

Recognition that younger children to be treated differently from older.

Growing influence of women on PE in schools.

More trained women PE staff.

Infants
(under 7's)
1919
Children
(over 7's)

Reduction in formal lesson style.

Teachers given more freedom to determine lesson content.

Effort to make them enjoyable.

Half of each lesson for games, dance, free movement.

Retained focus on formal therapeutic.

Focus on discipline.

Still teacher directed working in unison.

CHANGE

Raising of school leaving age to 14.

Building of Secondary Schools for children with gymnasia and playing fields.

Value of games and gymnastics recognised for older children.

Acceptance of value of independent group work.

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Part 22 Teaching Resource

‘Winds of change – Mid 20th Century Developments in PE

General Considerations & Objectives

1. To appreciate the impact of the 2nd World War (1939-45) in terms of the developments pre and post 1950.
2. To appreciate the impact on school physical education of the changing view of children and the role of education
3. A brief overview of the role of government in terms of school physical education.

The development of physical education in this 20 year period is subject to similar influences to those encountered in the last study pack. A gradual opening of opportunity albeit unevenly and not without a struggle. A changing view of how children should be developed and nurtured, women striving for and achieving more rights and opportunities against a background of economic development interrupted by the 2nd World War (1939 – 1945).

The combined effects of a push for greater political rights and the need for an educated work force rather than merely a subservient one also engendered developments in methods of teaching.

Teaching Strategy

Once again it would be useful for students to be required to make comparisons with what had gone before so that they may understand the concept of sport and physical education existing within a cultural and economic framework and subject to huge external influences.

This is also a good opportunity for them to start looking forward and noting the aspects of older syllabuses that are reflected in the present day National Curriculum.

It may be advantageous to combine the lesson preparation with that undertaken in Part 21. This would save time and allow a more longitudinal look at syllabus development. Indeed one could go as far and include a lesson from “Moving and Growing” and the modern day national curriculum and do them all in an hour. This would give the basis for useful general discussion as you then progressed chronologically. If the short lesson sequences were videoed then this could be used in class discussion as well.

Generally it is advisable to use homework/private study to get students to research and gather factual material, particularly when they share the burden of this amongst the group. It is vital that they all agree to give a short 65 minute presentation and have hand outs prepared for the other members of the group – and you! This approach allows you to draw the threads together in lessons and make the connections

Effects of World War Two 1939 - 1945

SECOND WORLD WAR

Large scale rebuilding in urban areas.

Military skills - now more dependent upon initiative and survival rather than obedience.

Value of physical recreation within prisoner of war camps.

Desire to provide for a better world for children in the future ‘. . . . .what were we fighting for?’.

Value of Halifax Experiment - children working individually, interpreting use of equipment, music etc.

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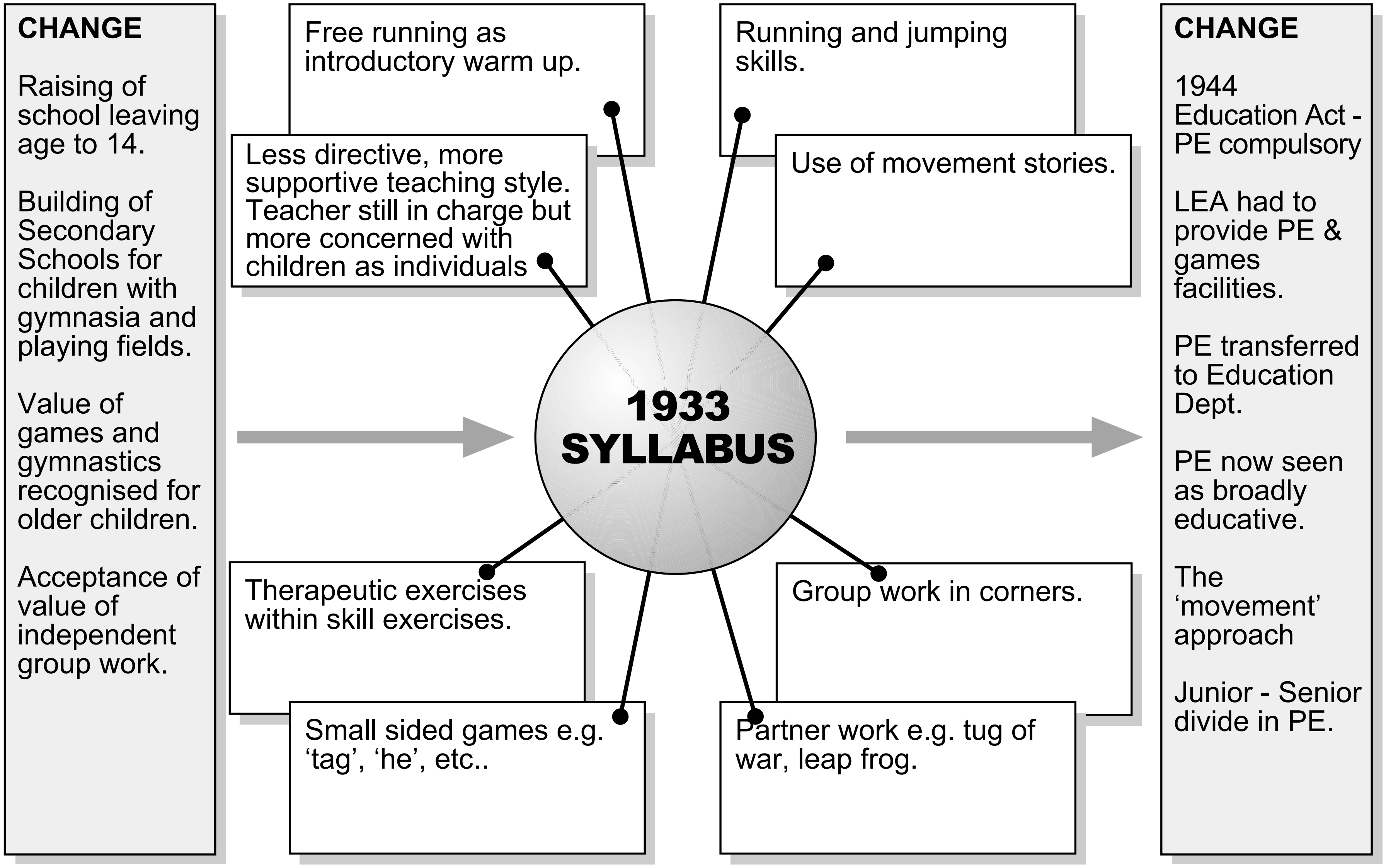
1930 - 1952 State School Physical Education - Process of Change



CHANGE

Raising of school leaving age to 14.

Building of Secondary Schools for children with gymnasia and playing fields.

Value of games and gymnastics recognised for older children.

Acceptance of value of independent group work.

1933 SYLLABUS

Free running as introductory warm up.

Less directive, more supportive teaching style. Teacher still in charge but more concerned with children as individuals

Running and jumping skills.

Use of movement stories.

Therapeutic exercises within skill exercises.

Small sided games e.g. ‘tag’, ‘he’, etc..

Group work in corners.

Partner work e.g. tug of war, leap frog.

CHANGE

1944 Education Act - PE compulsory

LEA had to provide PE & games facilities.

PE transferred to Education Dept.

PE now seen as broadly educative.

The ‘movement’ approach

Junior - Senior divide in PE.

1919 & 1933 Lesson Comparison

Resource Sheet

1919 Lesson	1933 Lesson
Activities	**Activities**
Objectives	**Objectives**
Teaching Style	**Teaching Style**
Reasons for Change	**Reasons for Change**

Part 23 Teaching Resource

‘Bringing the Child to Centre Stage – Early Beginnings of the Modern Curriculum’

General Considerations & Objectives

- The effects of child centred learning theories on PE curriculum and PE teachers.
- The effects of little central control on the curriculum on a child's PE experience in school.

Teaching Strategy

As suggested before the practical lessons could all be run one after the other offering the students an immediate opportunity to make their own comparisons. It would also be useful for them to reflect upon their own experiences of PE to see if the child centred or movement approach is one they encountered in their junior schools.

The debates allow for an opportunity to test understanding of the underpinning reasons for the development both in sport and physical education.

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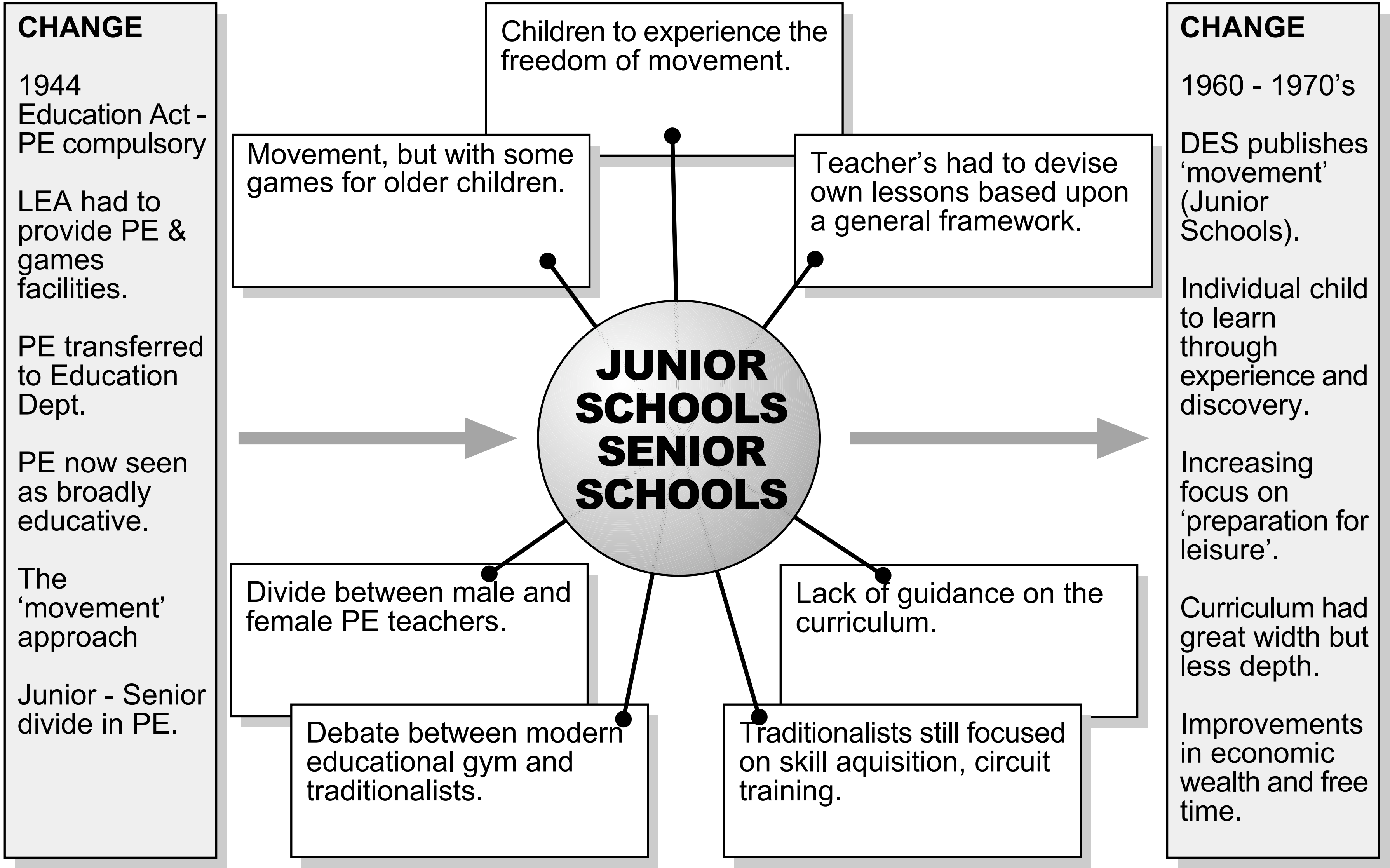
1952 - 1970 State School Physical Education - Process of Change



CHANGE

1944
Education Act - PE compulsory

LEA had to provide PE & games facilities.

PE transferred to Education Dept.

PE now seen as broadly educative.

The 'movement' approach

Junior - Senior divide in PE.

JUNIOR SCHOOLS SENIOR SCHOOLS

Children to experience the freedom of movement.

Movement, but with some games for older children.

Teacher's had to devise own lessons based upon a general framework.

Divide between male and female PE teachers.

Debate between modern educational gym and traditionalists.

Lack of guidance on the curriculum.

Traditionalists still focused on skill aquisition, circuit training.

CHANGE

1960 - 1970's

DES publishes 'movement' (Junior Schools).

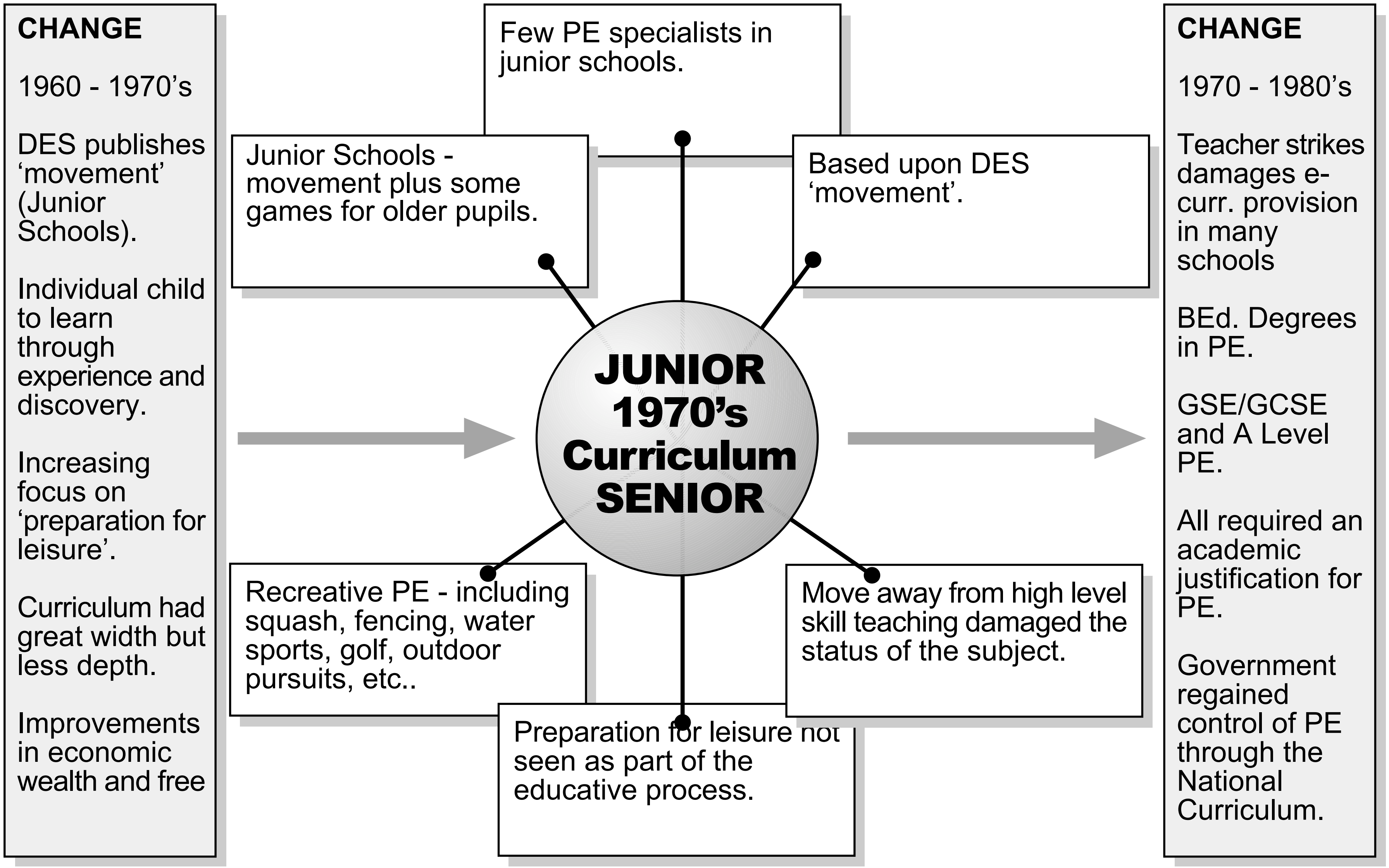
Individual child to learn through experience and discovery.

Increasing focus on 'preparation for leisure'.

Curriculum had great width but less depth.

Improvements in economic wealth and free time.

1970 State School Physical Education - Process of Change



CHANGE

1960 - 1970’s

DES publishes ‘movement’ (Junior Schools).

Individual child to learn through experience and discovery.

Increasing focus on ‘preparation for leisure’.

Curriculum had great width but less depth.

Improvements in economic wealth and free

JUNIOR 1970’s Curriculum SENIOR

Few PE specialists in junior schools.

Junior Schools - movement plus some games for older pupils.

Based upon DES ‘movement’.

Recreative PE - including squash, fencing, water sports, golf, outdoor pursuits, etc..

Move away from high level skill teaching damaged the status of the subject.

Preparation for leisure not seen as part of the educative process.

CHANGE

1970 - 1980’s

Teacher strikes damages e-curr. provision in many schools

BEd. Degrees in PE.

GSE/GCSE and A Level PE.

All required an academic justification for PE.

Government regained control of PE through the National Curriculum.

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1904 Model Course and 1952 ‘Moving & Growing’ Course Comparison

Resource Sheet

1904 Model Course	1952 ‘Moving & Growing’
Activities	**Activities**
Objectives	**Objectives**
Teaching Style	**Teaching Style**

Part 24 Teaching Resource Pack

‘From a Privilege to a Right – the Development of Public Provision’

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General Considerations & Objectives

- To understand how leisure time is changing in relation to work – leisure patterns. To understand how employment factors such as home working, mobile working, temporary contracts, and self-employment affect an individuals leisure patterns.
- Examine the range of provision provided within the local community and how it has responded to our changing work/leisure patterns.
- How local provision has been influenced by government policy.

Over the last 20 years of the 20th Century our opportunities for leisure have increased dramatically as result of increased wealth for most members of our society and the level of support that is provided through central or local government. This has been accompanied by a significant change in the working practices and conditions for many people, which has also impacted upon their leisure patterns. Finally central government has also demanded that local councils be far more accountable for effective and efficient use of the tax revenues they raise and the central government funding they receive. All these factors have produced changes in how local councils provide leisure opportunities for their local community.

Teaching Strategy

Although the students will be very aware of the functions and opportunities at their local leisure centres they may not be so familiar with how they are managed. A useful approach is to put them into the role of centre managers or local authority 'clients' and get them to work though the CCT and Best Value process.

‘Patterns of Work’ Questionnaire

1 What kind of work have you been involved in?

2 Which (choose one which best describes it from the following)? Industrial (primary), Manufacturing, or Service?

3 What were your standard hours (excluding overtime)?

4 Were you able to vary those hours at all – to suit yourself etc?

5 How many days/weeks holiday did you have in a year?

6 Were there any restrictions on when you could take those holidays?

7 Did your employer provide any leisure opportunities, subsidized trips, leisure facilities etc?

8 Were there any restrictions on when you could take those holidays?

9 Were you able to decide to work from home?

10 Did anybody else at your place of work have the opportunity to work at home?

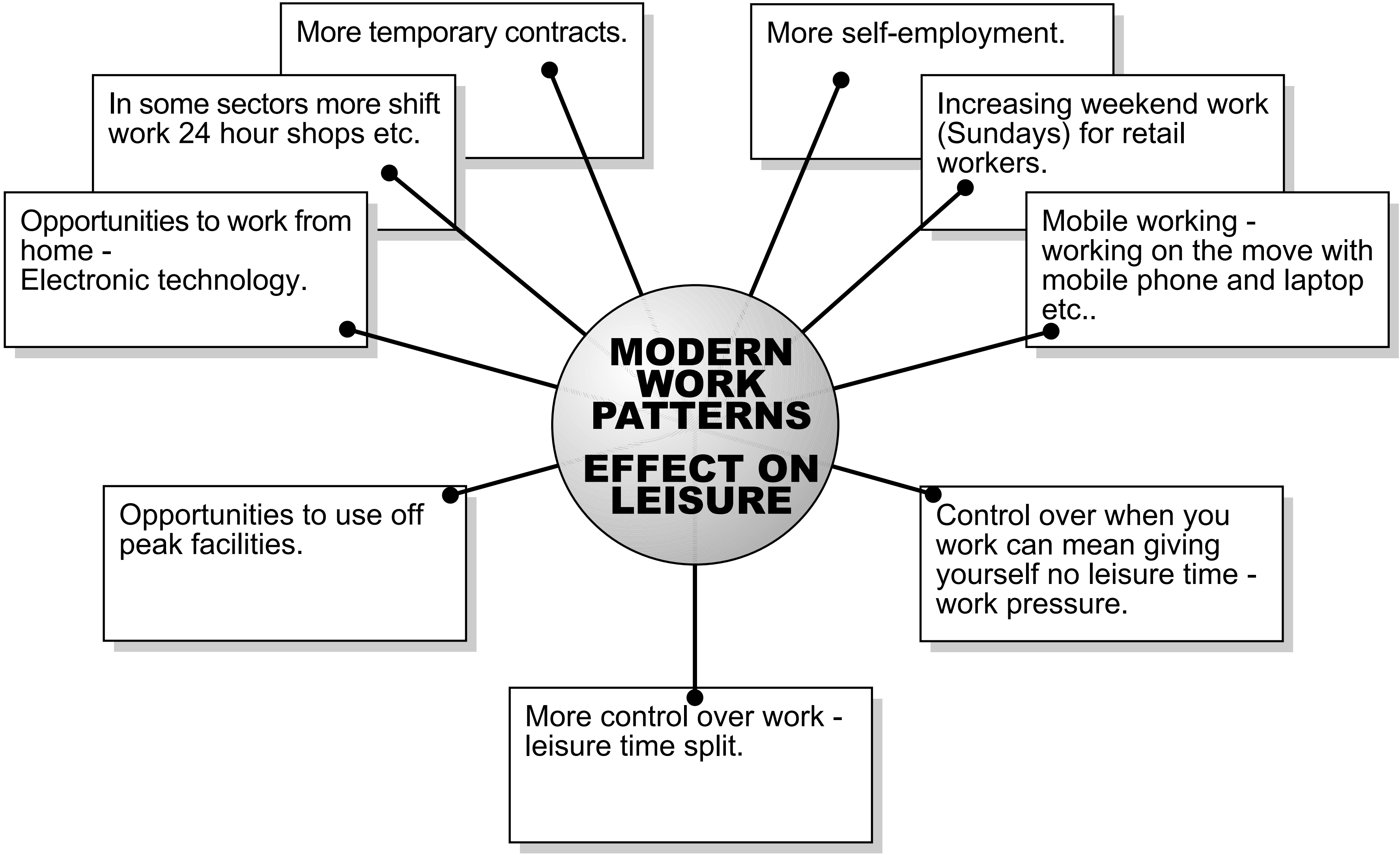
k

15 Years Ago & Now Work Pattern Comparison
Resource Sheet

Comparison of work/leisure patterns and provision

Now	15 Years Ago

Changing Work Patterns and the Effect on Leisure Opportunities



MODERN WORK PATTERNS

EFFECT ON LEISURE

More temporary contracts.

In some sectors more shift work 24 hour shops etc.

Opportunities to work from home -
Electronic technology.

Opportunities to use off peak facilities.

More control over work - leisure time split.

More self-employment.

Increasing weekend work (Sundays) for retail workers.

Mobile working - working on the move with mobile phone and laptop etc..

Control over when you work can mean giving yourself no leisure time - work pressure.

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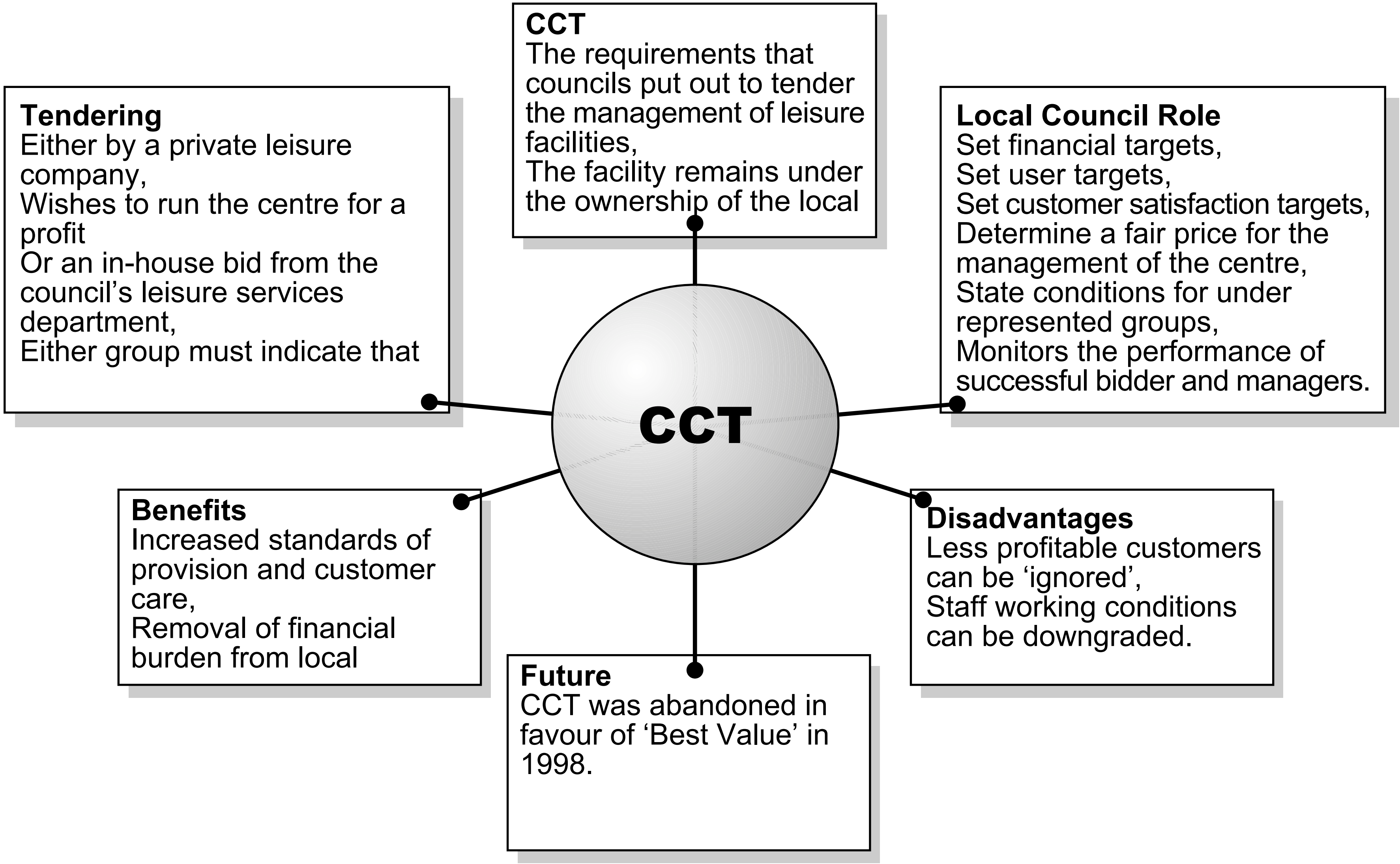
Cumpulsory Competitive Tendering



CCT
The requirements that councils put out to tender the management of leisure facilities,
The facility remains under the ownership of the local

Tendering
Either by a private leisure company,
Wishes to run the centre for a profit
Or an in-house bid from the council's leisure services department,
Either group must indicate that

Local Council Role
Set financial targets,
Set user targets,
Set customer satisfaction targets,
Determine a fair price for the management of the centre,
State conditions for under represented groups,
Monitors the performance of successful bidder and managers.

Benefits
Increased standards of provision and customer care,
Removal of financial burden from local

Disadvantages
Less profitable customers can be 'ignored',
Staff working conditions can be downgraded.

Future
CCT was abandoned in favour of 'Best Value' in 1998.

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General
Considerations & Objectives

- To understand the barriers that exist as a result of racism, sexism, class exclusivity and disability. To recognise how these barriers effect opportunities to participate in recreation and leisure.
- To know the government and national governing body policies that exist to combat and overcome these barriers.
- To be aware of the effectiveness of these policies.

The study pack examines the modern day barriers to participation as identified by Sport England in the More People programme and via sports equity targets ……

> *"to ensure that girls and young women; black, Asian and other ethnic minority communities; disabled people; and people from deprived communities do not miss out"*
>
> *(Sport England 1999)*

Students need to know how the barriers operate, the policies that are developed and utilised to overcome them and the success of those policies. By looking across a range of socio-cultural groups students are also able to identify features that are common to those groups and those that are unique. Students are also required to examine the extent to which the target groups have been involved in the development of sports equity targets.

Gender and class also have an historical perspective within the syllabus and this may be undertaken as part of the research, as a precursor or after a consideration of the modern day scene. Dealing with the historical after the modern does allow students the opportunity to see how historical factors are still impacting in the modern day.

This module also challenges students, and sometimes teachers, to examine their own perceptions, beliefs and prejudices

Teaching Strategies

- Students may well have experienced discrimination/ stereotyping, themselves and therefore start with a discussion from personal perspectives. Ask them to write a few paragraphs detailing their experiences, or act as interviewer.
- Students are then asked to research data on the comparative representation of various groups in terms of participation and that group's representation in the population as a whole.
- Use the OHT's provided for class discrimination and sexism, to promote and summarise discussions. Asking the students to prepare their own summary sheets for racism and disability should help them to see that although the groups are very diverse the underlying reasons for the discrimination and therefore the barriers to participation are very similar. This forms the basis for the final task.
- Research into the policies that are used by Sport England, National Governing Bodies and other organisations to achieve equality of opportunity for participation and progression.
- Discussion as to why there should be a need for such policies, what are the barriers that individuals in each group may face. This discussion could be underpinned with the resource sheets provided.
- Compiling a series of quotes, or quotes and pictures for posters to reflect the experiences of under-represented groups will often bring home the reality of discrimination far more than statistics

Access to Leisure and Recreation

Resource Sheets

Taken from "Best Value through Sport – the value of sport to the health of the nation" – English Sports Council

- In 1996 it was assessed that over 20 million adults in Britain had participated in sport on at least one occasion in the previous four weeks and, when walking over two miles was included, nearly 30 million people had participated.
- Between 1987 and 1996 participation in sport by older age groups increased significantly. In 1987 35% of those aged between 45 and 59 years had participated in sport (excluding walking) at least once in the previous four weeks and this increased to 40% in 1996. The growth in participation for the 60-69 year old age group was even more marked with an increase from 23% to 30% over the same time period.
- When surveyed in 1994 virtually all children in England aged 6-16 years had taken part in at least some sport in the previous year, and 98% had done so in their free time out of school lessons. In addition 96% of children said they enjoyed sport in at least one context whether it was in or out of school lessons.
- In 1994 in England young people aged 6-16 years took part in on average 14 different sports during the year, with on average nine different sports taken part in during their leisure time out of school lessons.
- The majority (78%) of young people had taken part in sport in a 'formal' context whether it was during extra-curricular time or as a member of a sports or youth club.
- In 1994 in England 49% of boys and 35% of girls aged 6-16 years had participated in sport as a member of an out-of-school sports club during the year.
- It is estimated from a national survey carried out in 1997 that, in an average four-week period, nearly one million people in England made in total 2.4 million visits to local authority sports halls. Similarly, during the same four-week period, 1.5 million people made 4.3 million visits to local authority swimming pools.

continued....

Gender Participation in sport is higher by men than by women although the gap is narrowing. In 1996 statistics for Great Britain showed that seven out of 10 men compared with six out of 10 women had participated in at least one activity in the previous four weeks.

Age In the early primary school years, girls' and boys' levels of participation in sport are similar. (In 1994 89.9% of boys in England regularly took part in at least one sport during the year 'out of lessons' compared with 87.3% of girls.) However, as children progress through their school years, the gap between boys' and girls' participation widens until, in the last two years of secondary school, the equivalent percentage for boys is 91.3% compared with 80.6% for girls.

Participation in sport declines significantly as people get older. In 1996 78% of 16-19 year olds in Britain had participated in at least one sporting activity in the previous four weeks. This declined to 57% by the time people reached the age of 30-44 years and to 30% between the ages of 60 and 69 years. Yet regular participation in sport can increase longevity and quality of life in older age.

Social class Levels of participation in sport are related to social class. In Britain in 1996 those in the professional socio-economic group were almost three times as likely to participate in sport (excluding walking) as those in the unskilled manual socio economic group (63% compared with 24% having participated at least once in the previous four weeks).

Social class differences extend to membership of sports clubs. In 1996,16% of those in the professional socio-economic group were members of a sports club compared with less than 5% of those in the semi-skilled manual group and less than 3% of those in the unskilled manual group. A survey of the use of local authority sports halls and pools in England carried out in 1997 showed that 10% of visitors came from the professional socio-economic group compared with 6% of the population of England as a whole, while only 8% of visitors were from the semi-skilled and unskilled manual groups compared with 19% of the population as a whole.

The 1997 survey showed that visitors to local authority swimming pools were more socially unrepresentative than those to halls. The proportion of visitors who were professionals was more than twice that expected from their proportion in the population, while the proportion of those from the semi-skilled and unskilled groups was around a third of the proportion expected.

continued....

Ethnicity Levels of participation in sport are not equal for all ethnic groups. In Britain, in 1996, 46% of white adults had participated in at least one activity excluding walking during the previous four weeks compared with 41% of black adults (Caribbean, African and 'other'), 37% of Indians and 25% of Pakistanis and Bangladeshis.

Ethnic minority groups are also under-represented in their use of local authority sports halls and swimming pools. The national survey carried out in 1997 showed that the proportion of visitors to swimming pools in England who categorized themselves as Black Caribbean was a third of what would be expected from the numbers in the population, while representation by Black Africans was one fifth, Indians one third, Pakistanis half, and Bangladeshis half of what would be expected.

Disability Inequalities also exist in relation to the use of local authority halls and pools by people with a long-standing illness or disability. Focusing on the younger age group of 16-44 year olds (to exclude age-related disability), the 1997 survey showed that in England only 6% of visitors to swimming pools had a disability compared with 15% of the population, while for halls the proportion with a disability was even lower at 4%.

Barriers to Participation

Discussion Resource

Guardian

The Football Association bowed to the inevitable last night, sacking the England coach Glenn Hoddle for "a serious error of judgment" that had offended disabled people and threatened to stain the reputation of the national game.

Soon after the announcement - which came after a day of tortured negotiations between Hoddle and the FA - the England coach appeared before the cameras to apologise for the enormous upset that he had caused. He admitted causing "misunderstanding and pain to a number of people". He added: "This was never my intention and for this I apologise."

Hoddle maintained that he was misrepresented by an interview in the Times newspaper which suggested that he believed disabled people were paying for indiscretions committed in previous lives.

Telegraph

JORG HAIDER'S Austrian far-Right Freedom Party has come under fire for attacking the disabled in an advertising campaign.

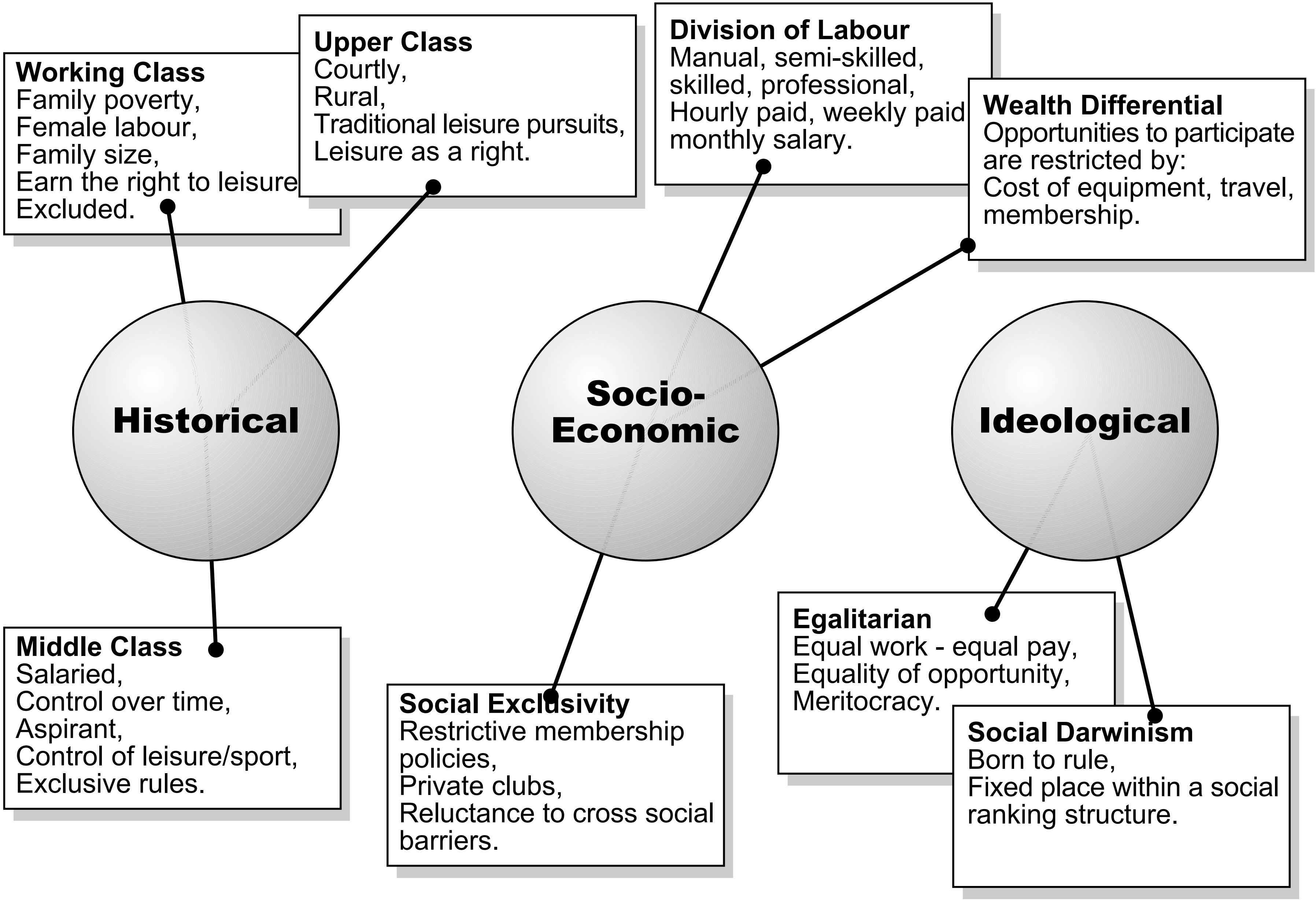
The advertisements, which proclaim "there can only be a strong mind in a healthy body", show Haider and young healthy-looking party members in sporting activities such as mountain climbing, snowboarding and marathon running.

But rival politicians have said the campaign was an insult to the disabled.

Guardian

In wheelchair fencing, the chairs are clamped and do not move, so the piste is not the battleground it could be. "Fencing is much easier for the able-bodied; when the blows are coming they can run out of the way," added Heaton. The wheelchair fencers rely on their own adroitness in the chair to avoid blows and refine the art of parrying to its limits. At the Red Rose club in Blackpool, to which Heaton belongs, training often involves competition against the able-bodied fencers. "It perhaps benefits them even more than me because they are in a wheelchair and have to rely on very specific skills," he added.

Barriers to Participation - Class



Historical

Working Class
Family poverty,
Female labour,
Family size,
Earn the right to leisure,
Excluded.

Upper Class
Courtly,
Rural,
Traditional leisure pursuits,
Leisure as a right.

Middle Class
Salaried,
Control over time,
Aspirant,
Control of leisure/sport,
Exclusive rules.

Socio-Economic

Division of Labour
Manual, semi-skilled,
skilled, professional,
Hourly paid, weekly paid
monthly salary.

Wealth Differential
Opportunities to participate
are restricted by:
Cost of equipment, travel,
membership.

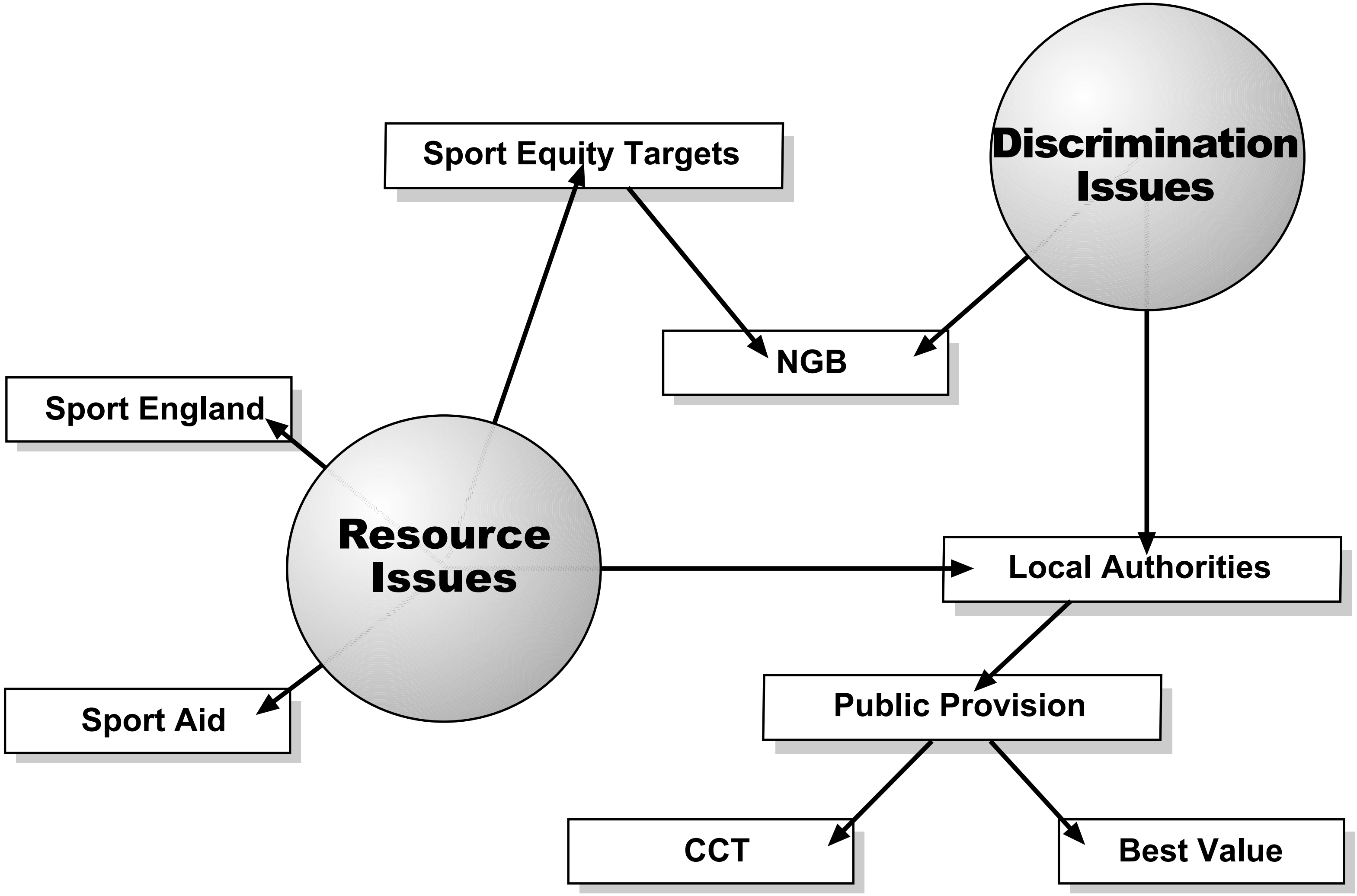
Social Exclusivity
Restrictive membership
policies,
Private clubs,
Reluctance to cross social
barriers.

Ideological

Egalitarian
Equal work - equal pay,
Equality of opportunity,
Meritocracy.

Social Darwinism
Born to rule,
Fixed place within a social
ranking structure.

Overcoming the Socio-Economic Barrier



Sport Equity Targets

Discrimination Issues

NGB

Sport England

Resource Issues

Local Authorities

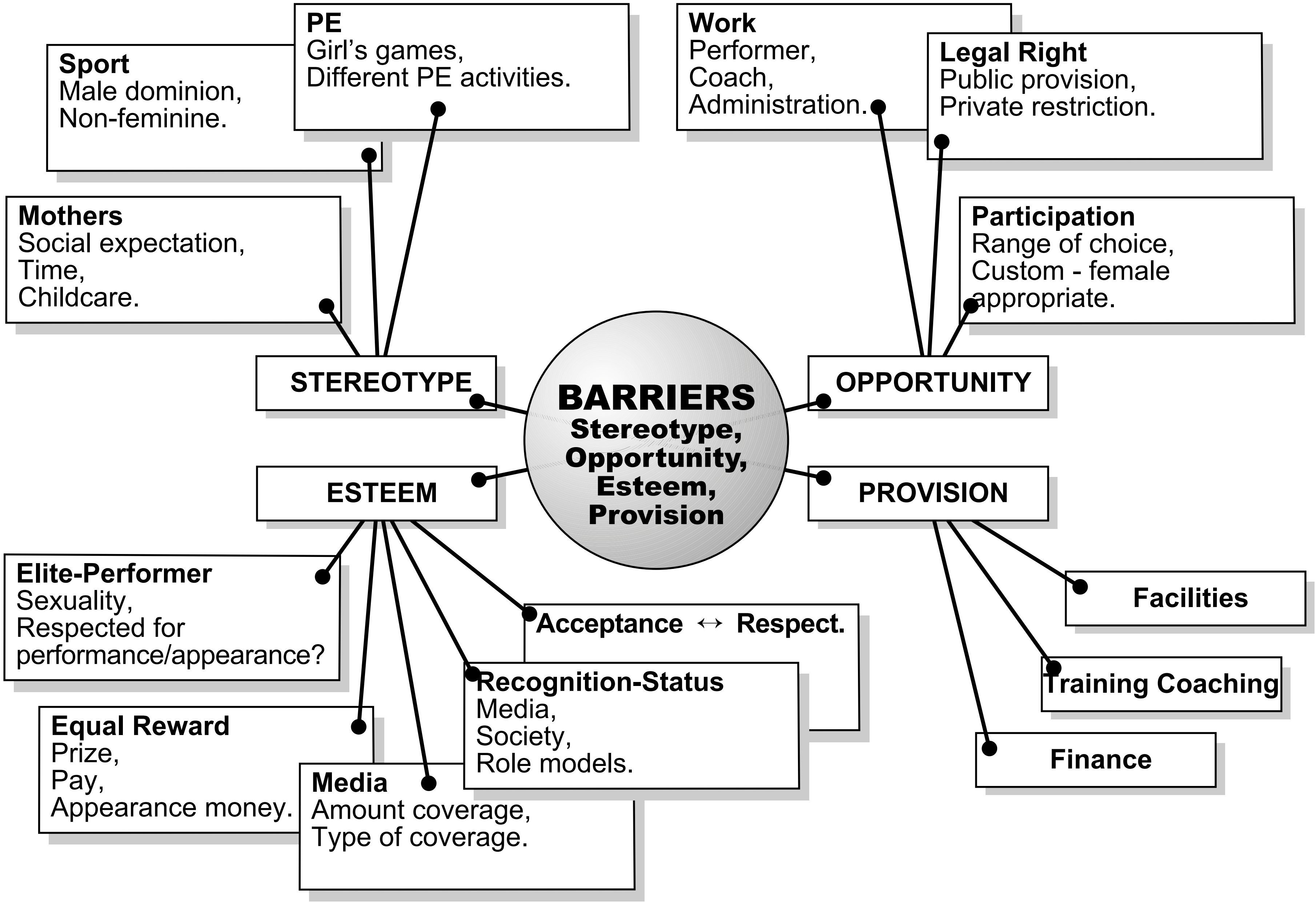
Sport Aid

Public Provision

CCT

Best Value

Barriers to Participation - Sexism



BARRIERS
Stereotype, Opportunity, Esteem, Provision

STEREOTYPE

Sport
Male dominion,
Non-feminine.

PE
Girl's games,
Different PE activities.

Mothers
Social expectation,
Time,
Childcare.

OPPORTUNITY

Work
Performer,
Coach,
Administration.

Legal Right
Public provision,
Private restriction.

Participation
Range of choice,
Custom - female appropriate.

ESTEEM

Elite-Performer
Sexuality,
Respected for performance/appearance?

Equal Reward
Prize,
Pay,
Appearance money.

Media
Amount coverage,
Type of coverage.

Recognition-Status
Media,
Society,
Role models.

Acceptance ↔ Respect.

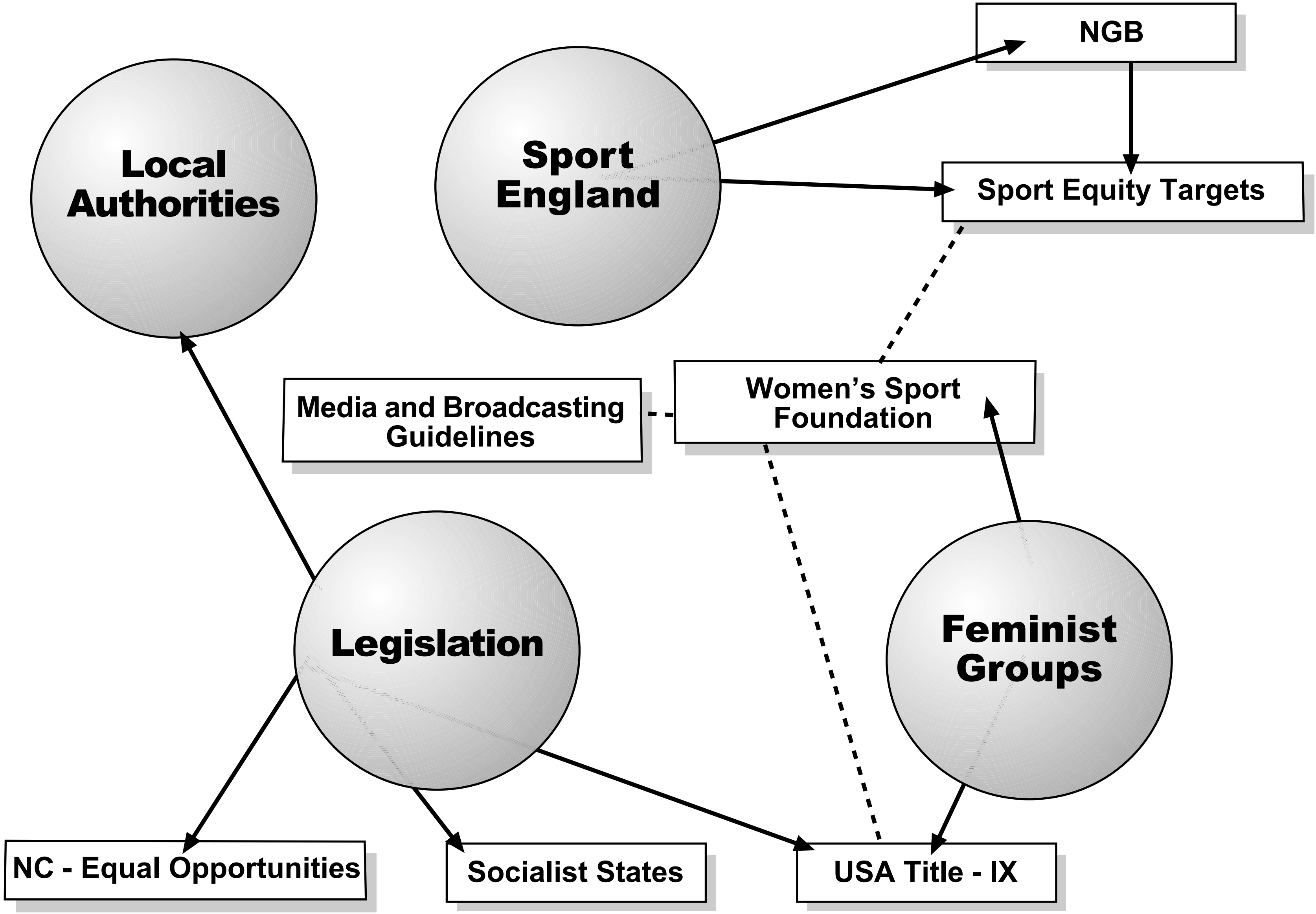
PROVISION

Facilities

Training Coaching

Finance

Overcoming the Barrier of Sexism



Local Authorities

Sport England

NGB

Sport Equity Targets

Media and Broadcasting Guidelines

Women's Sport Foundation

Legislation

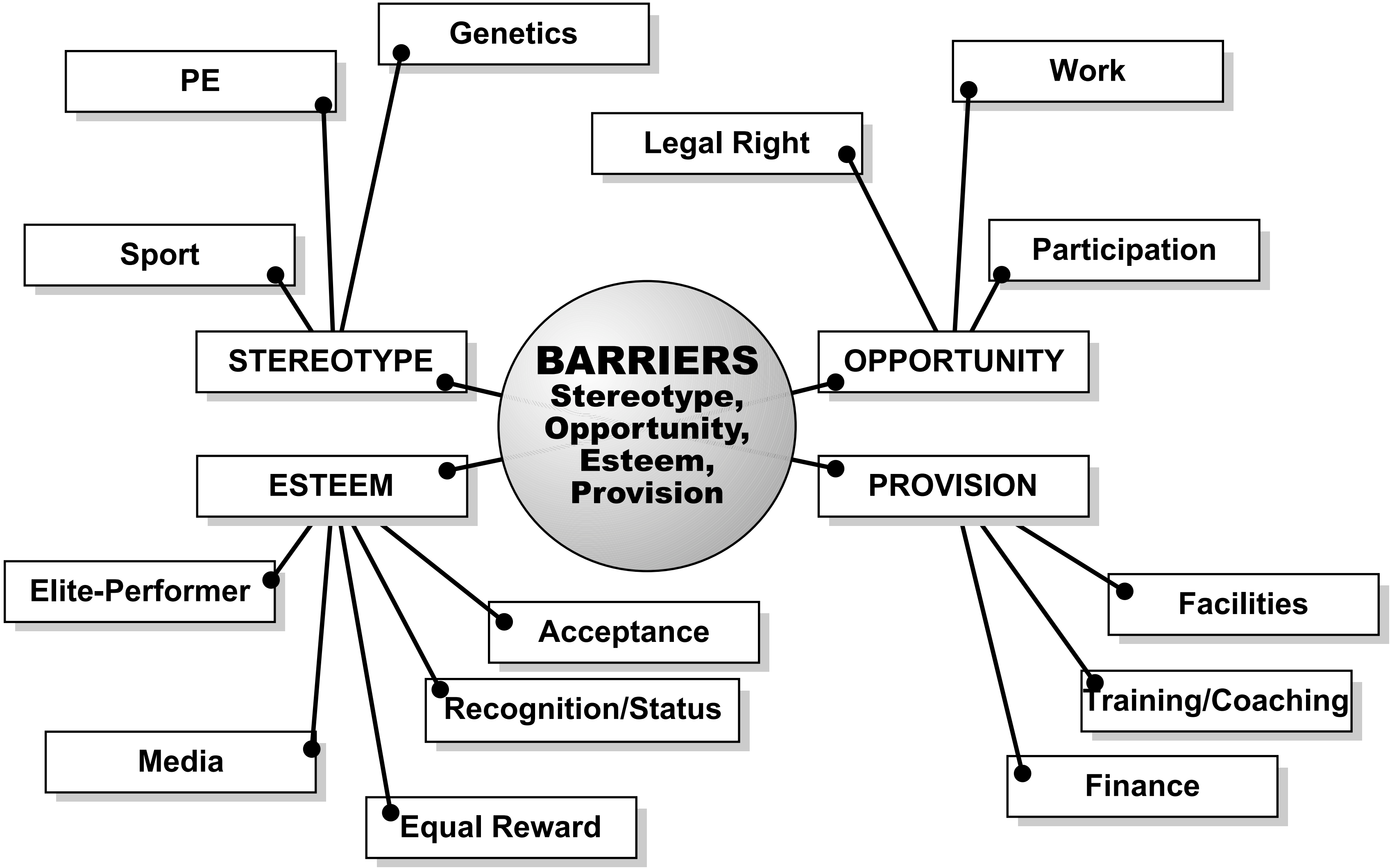
Feminist Groups

NC - Equal Opportunities

Socialist States

USA Title - IX

Barrier to Participation - Racism



BARRIERS
Stereotype, Opportunity, Esteem, Provision

- STEREOTYPE
  - Sport
  - PE
  - Genetics
- OPPORTUNITY
  - Legal Right
  - Work
  - Participation
- ESTEEM
  - Elite-Performer
  - Media
  - Equal Reward
  - Recognition/Status
  - Acceptance
- PROVISION
  - Facilities
  - Training/Coaching
  - Finance

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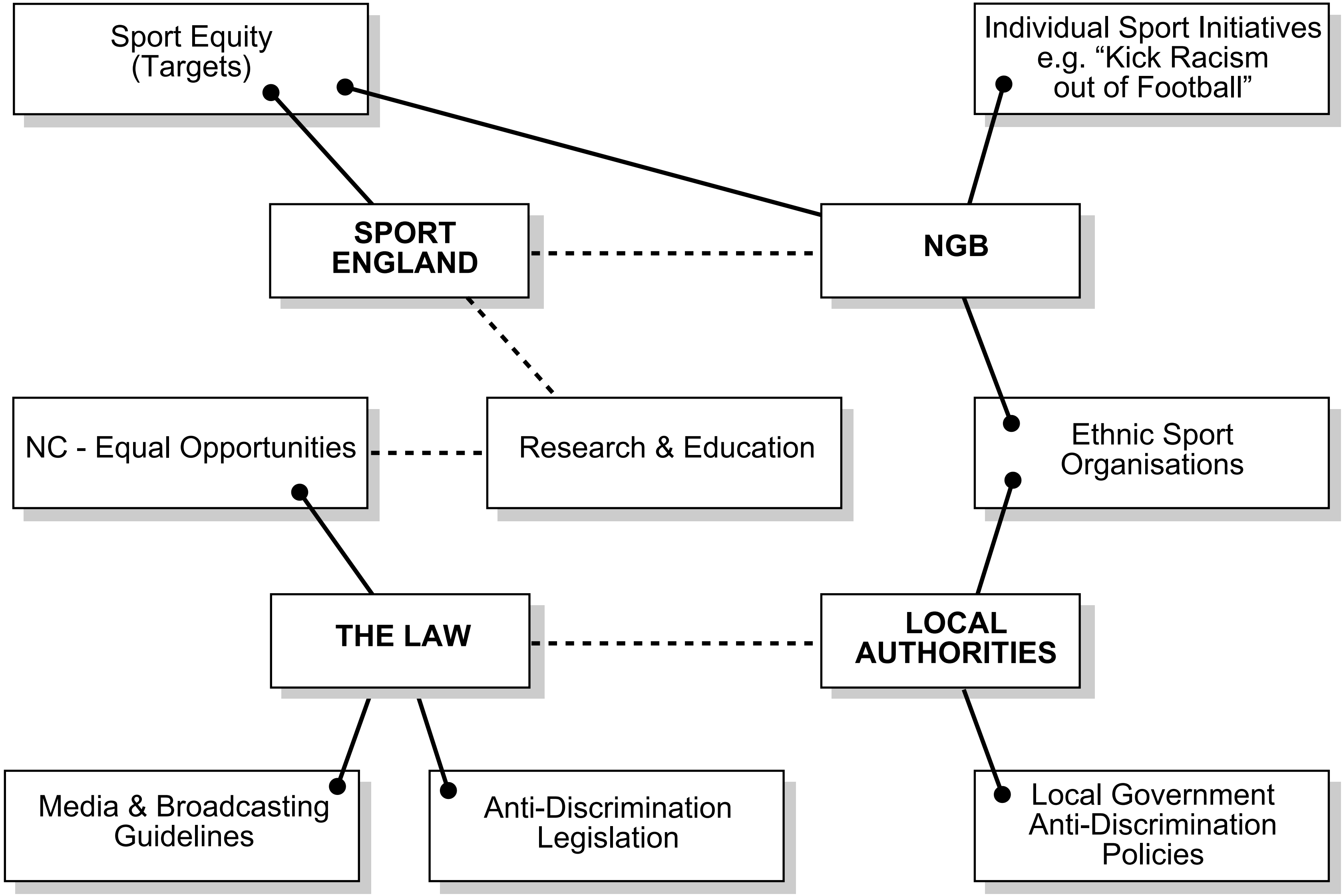
Overcoming the Barrier of Racism



Sport Equity (Targets)

Individual Sport Initiatives e.g. "Kick Racism out of Football"

SPORT ENGLAND

NGB

NC - Equal Opportunities

Research & Education

Ethnic Sport Organisations

THE LAW

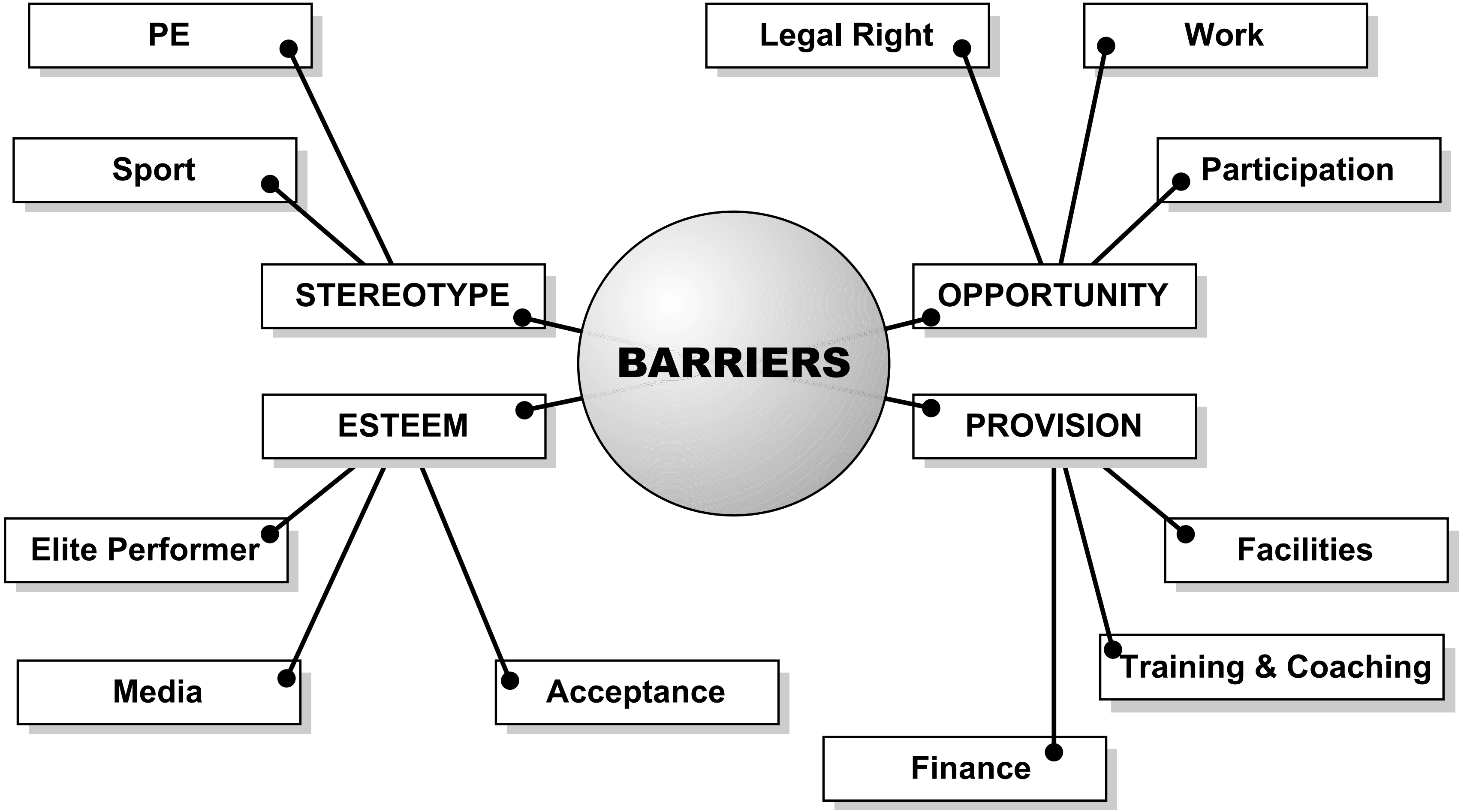
LOCAL AUTHORITIES

Media & Broadcasting Guidelines

Anti-Discrimination Legislation

Local Government Anti-Discrimination Policies

Barriers to Participation - Disability



BARRIERS

STEREOTYPE
- PE
- Sport

ESTEEM
- Elite Performer
- Media
- Acceptance

OPPORTUNITY
- Legal Right
- Work
- Participation

PROVISION
- Facilities
- Training & Coaching
- Finance

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General Considerations & Objectives

- The links between PE, leisure recreation and sport.
- What determines the route an individual may take.

This final module asks students to understand the progression that an individual might make from a physical education programme to a regular participant in sport. It is not necessary for students to consider the transition to an elite performer (despite the title of the pack)

Teaching Strategy

The use of the questionnaire is to identify the range of factors, motivations, chance encounters that might guide, prompt or inhibit an individuals progress or rejection on a journey from early experiences to becoming a club regular.

This will enable the student to relate back to personal circumstances and experiences. To get a more global view use is made of research documents from sport England. The Sport England website is an invaluable source for these publications.

‘From Recreation to Elite?’
Questionnaire

1 What PE activities did you participate in when at Junior School (Years 0-6, age 5-11)?

2 As far as you can remember did you enjoy PE at Junior School?

3 Were you playing any sport outside of school at that time?

4 Did you do a wider or narrower range of activities in KS3 (Y7-9, age 11-14)?

5 Did you give up any outside school sport activities during this period

6 Did you take up any sport you played in school with a club outside?

The following questions should be responded to on a scale of 1 – 4 with 1 being the lowest or weakest response and 4 the strongest

1 Weakest or lowest response = **Not at all**

2 Fairly weak = **Some**

3 Fairly strong = **Quite a strong influence**

4 Strongest = **Powerful influence, very strong**

Please tick the box which closely matches your response.

7 My parents influenced what non-school based sport and physical recreation I participated in.

Age 5 – 11

Not at all ☐ Some ☐ Quite a strong influence ☐ Very strong influence ☐

Age 11-14

Not at all ☐ Some ☐ Quite a strong influence ☐ Very strong influence ☐

Age 14-18

Not at all ☐ Some ☐ Quite a strong influence ☐ Very strong influence ☐

8 My PE teacher had a strong influence on the non-school activities I took up.

Age 5 – 11

Not at all ☐ Some ☐ Quite a strong influence ☐ Very strong influence ☐

Age 11-14

Not at all ☐ Some ☐ Quite a strong influence ☐ Very strong influence ☐

Age 14-18

Not at all ☐ Some ☐ Quite a strong influence ☐ Very strong influence ☐

continued....

9 My friends influenced which non-school activities I took up

Age 5 – 11

Not at all ☐ Some ☐ Quite a strong influence ☐ Very strong influence ☐

Age 11-14

Not at all ☐ Some ☐ Quite a strong influence ☐ Very strong influence ☐

Age 14-18

Not at all ☐ Some ☐ Quite a strong influence ☐ Very strong influence ☐

10 The school PE kit requirements influenced my enthusiasm for PE

Age 5 – 11

Not at all ☐ Some ☐ Quite a strong influence ☐ Very strong influence ☐

Age 11-14

Not at all ☐ Some ☐ Quite a strong influence ☐ Very strong influence ☐

Age 14-18

Not at all ☐ Some ☐ Quite a strong influence ☐ Very strong influence ☐

continued....

11 When able to choose my activities what my friends chose was an influence on me

Age 11-14

Not at all ☐ Some ☐ Quite a strong influence ☐ Very strong influence ☐

Age 14-18

Not at all ☐ Some ☐ Quite a strong influence ☐ Very strong influence ☐

12 Whether the activity was inside or outside influenced my choice of activity

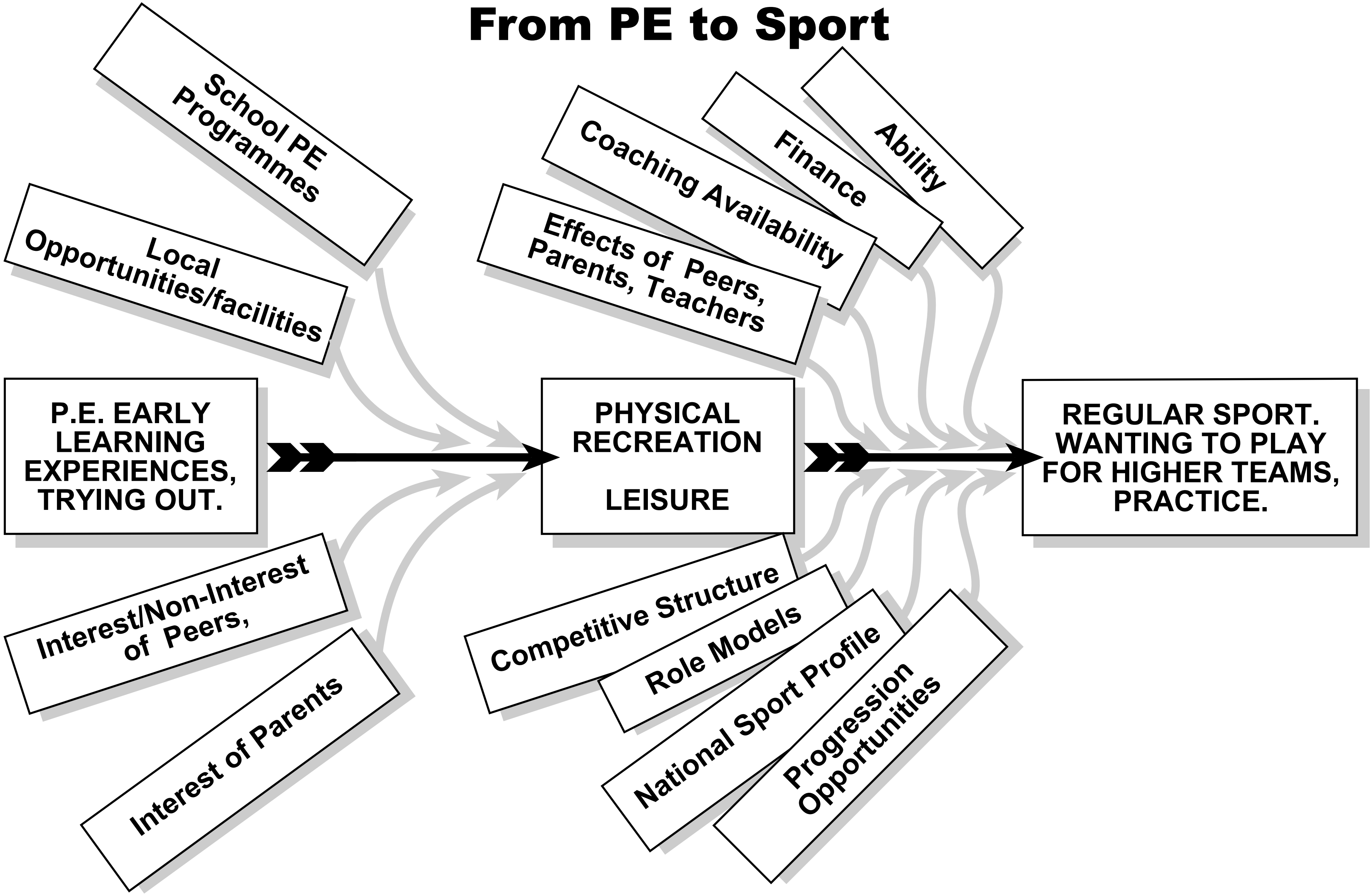
Age 11-14

Not at all ☐ Some ☐ Quite a strong influence ☐ Very strong influence ☐

Age 14-18

Not at all ☐ Some ☐ Quite a strong influence ☐ Very strong influence ☐

From PE to Sport



School PE Programmes

Local Opportunities/facilities

Interest/Non-Interest of Peers,

Interest of Parents

P.E. EARLY LEARNING EXPERIENCES, TRYING OUT.

PHYSICAL RECREATION

LEISURE

Coaching Availability

Finance

Ability

Effects of Peers, Parents, Teachers

Competitive Structure

Role Models

National Sport Profile

Progression Opportunities

REGULAR SPORT. WANTING TO PLAY FOR HIGHER TEAMS, PRACTICE.

Part 27 Teaching Resource Pack

‘Sports - What are They?’

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General Considerations and Objectives

- To understand the nature of the problems and challenge that individual sport activities set for performers.
- To be able to analyse and classify sports on the basis of their common characteristics and requirements and to understand that such classifications may be arbitrary.
- To understand the qualities that performers need to be able to meet the challenges set by particular sport activities

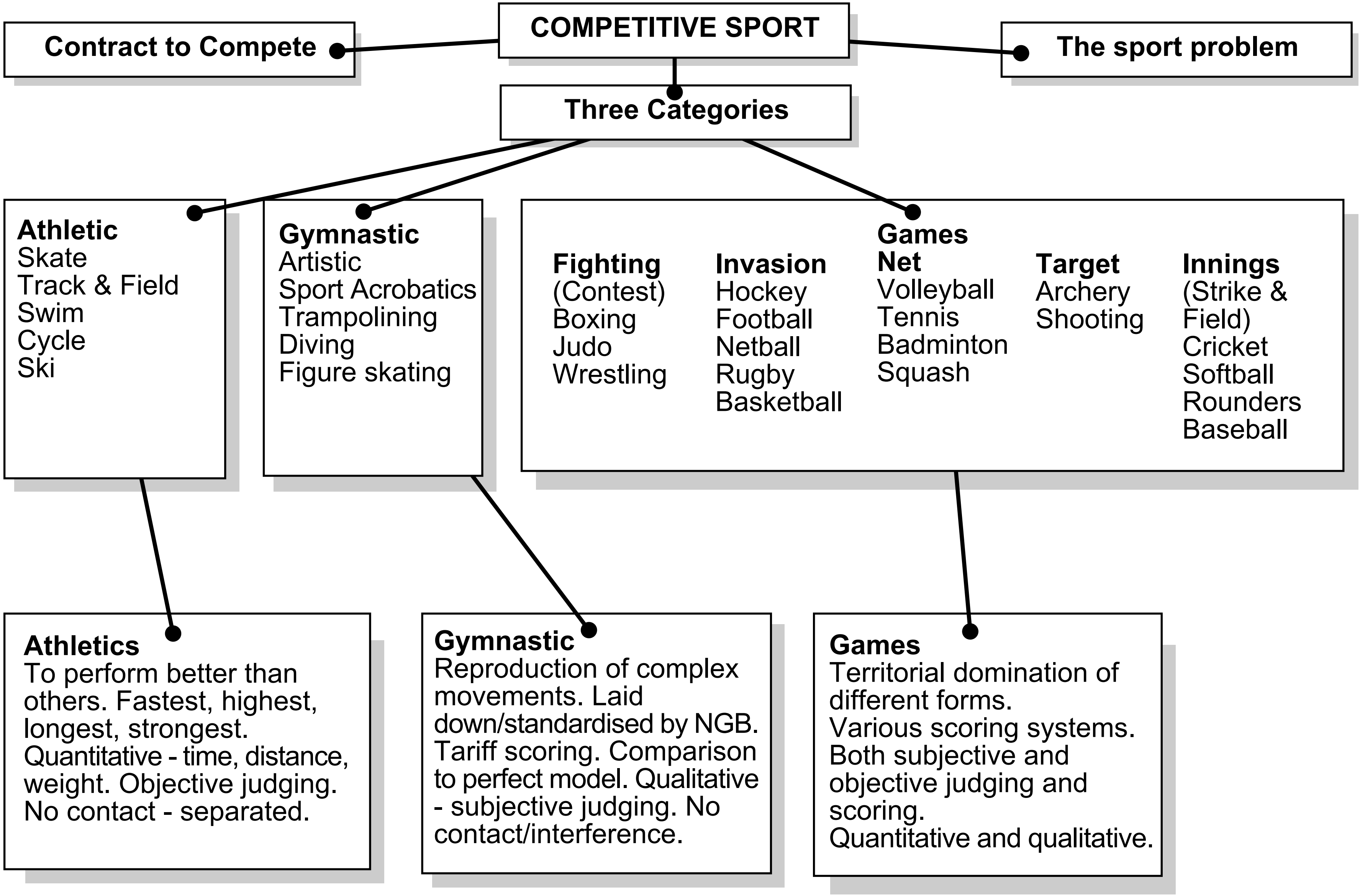
Students assume that classifying sports into categories will be a fairly simple activity. Tasks 1 & 2 will probably disabuse them of this notion and will lead them into a discussion from which the conclusion might be that these distinctions and classifications may be fairly arbitrary, especially if McIntosh’s and Callois classifications are also introduced.

The sport analysis activity helps to make the point that to be successful in a sport activity an individual needs the wherewithal to meet the unique challnges that each activity poses. It also makes the point that activities that might on the surface seem to be rather similar can often be dissimilar when scrutinised more carefully within this analytical process.

Teaching Strategy

- The tasks lend themselves to both discussion and observation. The discussion of the classification will begin with rather vague assertions from students and it is important to bring them to a more analytical approach through guided questions.
- The observation and assessment tasks will also support the development of these skills in relation to their coursework. Once again skilful questioning by the teacher will lead students into adopting a more analytical approach. Exam questions in this area will almost always require students to use the criteria rather than merely state what they are.
- The use of small group/pairs and then a summary or plenary session allows for a greater range of sport activities to be analysed without spending too much time overall.

Competitive Sport - an Analysis



COMPETITIVE SPORT

Contract to Compete

The sport problem

Three Categories

Athletic
Skate
Track & Field
Swim
Cycle
Ski

Gymnastic
Artistic
Sport Acrobatics
Trampolining
Diving
Figure skating

Games

Fighting
(Contest)
Boxing
Judo
Wrestling

Invasion
Hockey
Football
Netball
Rugby
Basketball

Net
Volleyball
Tennis
Badminton
Squash

Target
Archery
Shooting

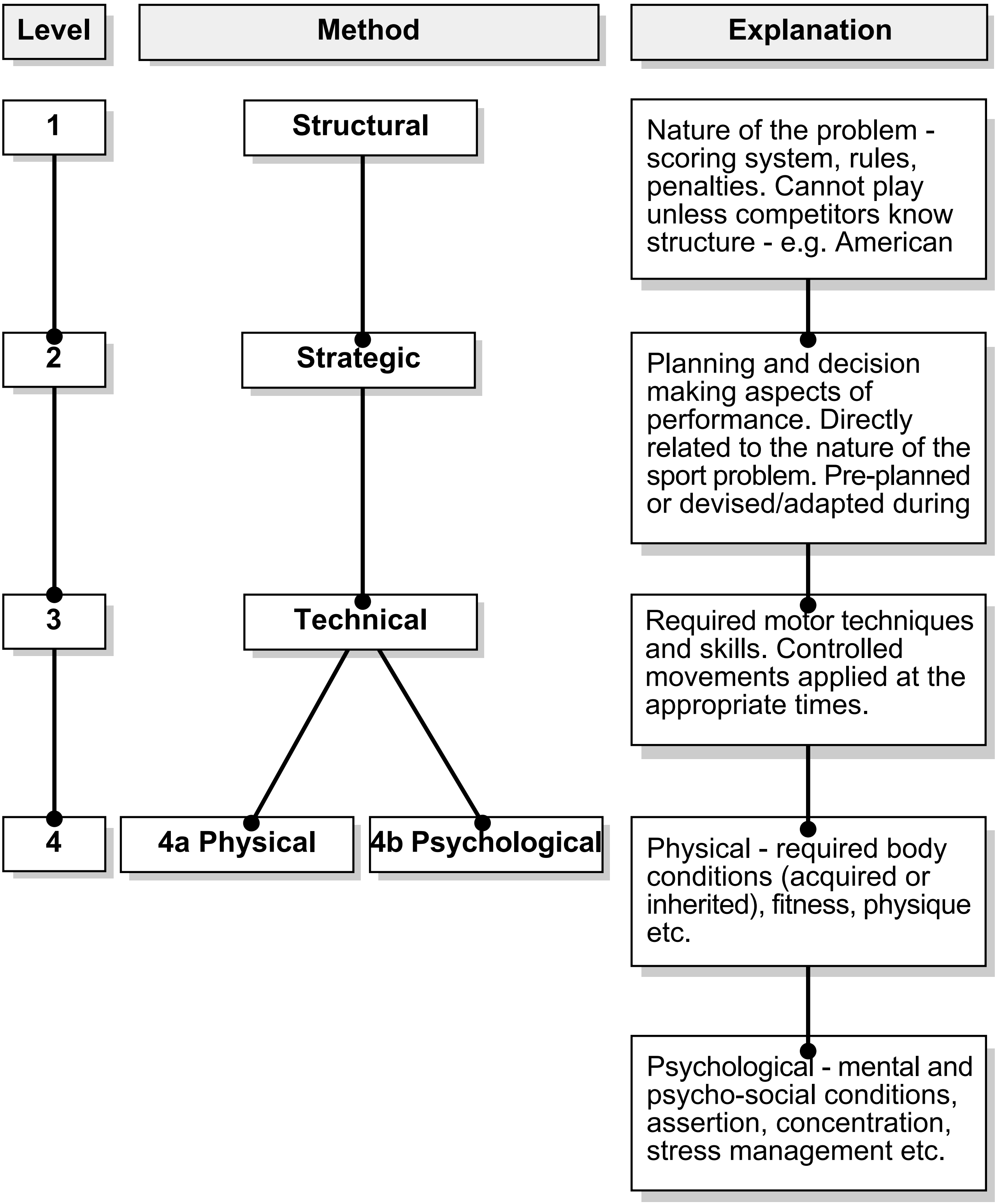
Innings
(Strike & Field)
Cricket
Softball
Rounders
Baseball

Athletics
To perform better than others. Fastest, highest, longest, strongest. Quantitative - time, distance, weight. Objective judging. No contact - separated.

Gymnastic
Reproduction of complex movements. Laid down/standardised by NGB. Tariff scoring. Comparison to perfect model. Qualitative - subjective judging. No contact/interference.

Games
Territorial domination of different forms.
Various scoring systems.
Both subjective and objective judging and scoring.
Quantitative and qualitative.

Competitive Sport - an Analysis



Level	Method	Explanation
1	Structural	Nature of the problem - scoring system, rules, penalties. Cannot play unless competitors know structure - e.g. American
2	Strategic	Planning and decision making aspects of performance. Directly related to the nature of the sport problem. Pre-planned or devised/adapted during
3	Technical	Required motor techniques and skills. Controlled movements applied at the appropriate times.
4	4a Physical	Physical - required body conditions (acquired or inherited), fitness, physique etc.
	4b Psychological	Psychological - mental and psycho-social conditions, assertion, concentration, stress management etc.

Sport Analysis

Name **Sport**

Characteristic	Descriptive Analysis
Structural	
Strategic	
Technical	
Physiological	
Psychological	

Sport Activity Analysis – Resource Sheet

Place each of the following sport activities into the most appropriate category and give one key feature which you used to place it there.

	Athletic	Gymnastic	Game	Key Feature
Slalom Skiing	☐	☐	☐	
Cross-Country	☐	☐	☐	
Gymnastics	☐	☐	☐	
Golf	☐	☐	☐	
Swimming	☐	☐	☐	
Netball	☐	☐	☐	
Football	☐	☐	☐	
Dance	☐	☐	☐	
Rugby	☐	☐	☐	
Hockey	☐	☐	☐	
Weight Lifting	☐	☐	☐	
Tennis	☐	☐	☐	
Biathlon	☐	☐	☐	

Group Analysis Sheet

Sport Activity **Team**

Score each player from 1 to a maximum 10 for each of the criteria

Name	Structural	Strategic	Technical	Physiolog	Psycholog	Total

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